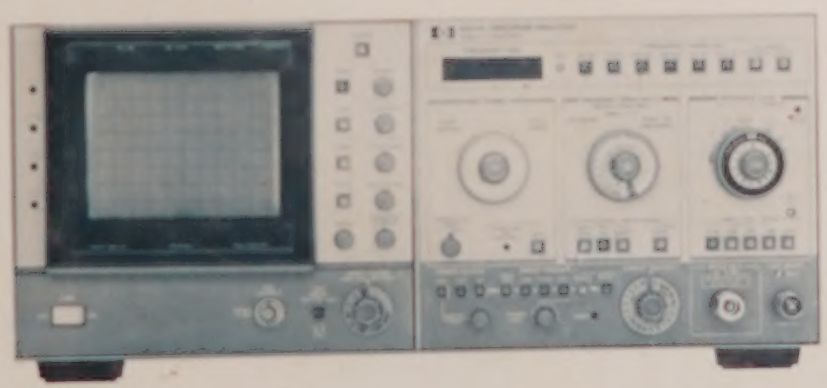
OPERATING AND SERVICE MANUAL

8565A
SPECTRUM ANALYZER
.01—40 GHz



HEWLETT hp PACKARD

SPECTRUM ANALYSIS . . .
Using the HP 11517A External Mixer to 40 GHz

INTRODUCTION

Spectrum analyzers, such as the HP 8555A and 8565A, are able to directly measure signals up to 18 and 22 GHz, respectively. In order to measure signals above this frequency, an HP 11517A external mixer must be used in place of the analyzer's first mixer to convert an input frequency down to the analyzer's first intermediate frequency (IF).

There are two techniques used to produce this IF, harmonic mixing and fundamental mixing. Harmonic mixing uses the harmonics of the analyzer's internal local oscillator (LO) for mixing, while fundamental mixing uses the fundamental frequency from an external sweep oscillator to provide the LO for mixing. This application note will emphasize measurement techniques using harmonic and fundamental mixing with the spectrum analyzer and external mixer up to 40 GHz.

MIXER POWER LIMITATIONS

The mixer's power limitations are of primary importance. Table 1 summarizes the input signal power limitations of the HP 11517A external mixer for both harmonic and fundamental mixing.

	Harmonic Mixing	Fundamental Mixing
Maximum RF Signal Input Level (Mixer Damage Level)	> 0 dBm	> 0 dBm
Saturation Input Level (<1 dB Gain Compression)	>−15 dBm	>−15 dBm
Optimum Input Level (Spurious Products < Noise)	−20 dBm	−35 dBm
Typical Average Noise Level (10 kHz Resolution Bandwidth)	< −60 dBm	< −85 dBm

Table 1. Signal power limitations of the HP 11517A external mixer measured at the mixer's waveguide input port. The fundamental mixing limitations assume an LO power of 0 dBm (1 mW) applied to the mixer's waveguide input port.

THEORY OF OPERATION

Harmonic Mixing

Using the set-up shown in Figure 1, with the spectrum analyzer switched into one of its external mixer bands and an input signal (RF) applied to the mixer, three signals are present at the analyzer's external mixer BNC port: the analyzer's local oscillator (LO), the intermediate frequency (IF), and the external mixer bias (I_{BIAS}).

The LO is the spectrum analyzer's first local oscillator [illegible] sweeps from approximately 2 to 4 GHz and generates harmonics in the mixer. These harmonics mix with the RF input signal to generate a 2.05 GHz intermediate frequency (IF).

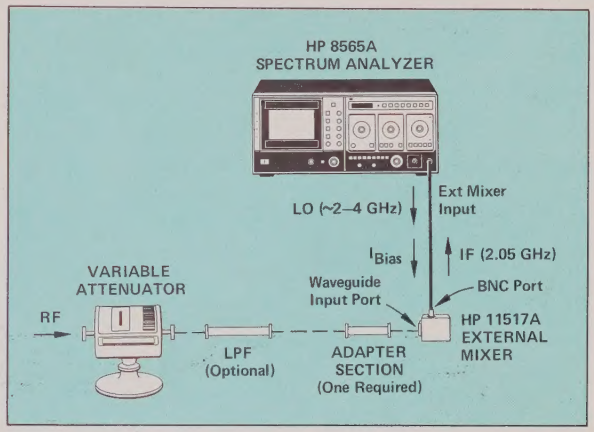


Figure 1. Harmonic mixing set-up.

The IF travels back to the analyzer, is passed through a 2.05 GHz bandpass filter network in the analyzer, is processed by further filtering and amplification, is detected, and finally displayed on the CRT. Since the 2.05 GHz IF is generated for more than one unique LO frequency, the signal identifier switch must be used to determine the correct response. Use of the external mixer does not affect the signal identifier process.

The optional LPF may be used to simplify signal identification by limiting higher frequency signals from the mixer. The filter's cutoff frequency should be just above the frequency band under measurement.

Because the BNC coaxial cable is moderately lossy in the frequency range of the LO and IF, the cable cannot become excessively long. Therefore, it is best to use the HP 10503A cable supplied with the mixer or up to 1.2 meters (4 feet) of RG-58 (50 Ω) coaxial cable.

The I_{BIAS} signal is a dc current controlled by the external mixer BIAS adjustment on the spectrum analyzer. This current will bias the mixer diode for minimum conversion loss by changing the diode conduction angle. In harmonic mixing, the optimum conduction angle varies with the LO frequency and harmonic number. To optimize the mixer, adjust the BIAS to peak the signal. Since more than one peak normally occurs, it is important to adjust the BIAS to the maximum peak. The best frequency response (flatness) is achieved by optimizing the mixer for every 500 MHz change in RF input signal frequency or whenever frequency bands are changed.

The EXT MIXER INPUT port bypasses the input attenuator and the first mixer of the analyzer. Although the attenuator will not affect the CRT display, it is coupled to the reference level control and will affect the reference level reading. Therefore, the attenuator must not be changed after an amplitude reference has been chosen. On analyzers with internal preselection, such as the HP 8565A, the preselector is also bypassed. Hence, the PRESELECTOR PEAK control will not affect the display. All other controls on the analyzer function as usual.

Fundamental Mixing

Fundamental mixing, although it requires a high frequency sweep oscillator, has several advantages over harmonic mixing. Because mixing is performed with the fundamental frequency of the LO, only two responses, separated by twice the IF frequency (4.1 GHz), are produced by the mixer and displayed on the spectrum analyzer for each RF signal present at the input. This greatly reduces the effort involved in signal identification. Fundamental mixing also enhances sensitivity by as much as 20 dB and reduces the frequency response (flatness) to as little as ±1 dB.

In the fundamental mixing mode, the external mixer is connected to the spectrum analyzer as shown in Figure 2.

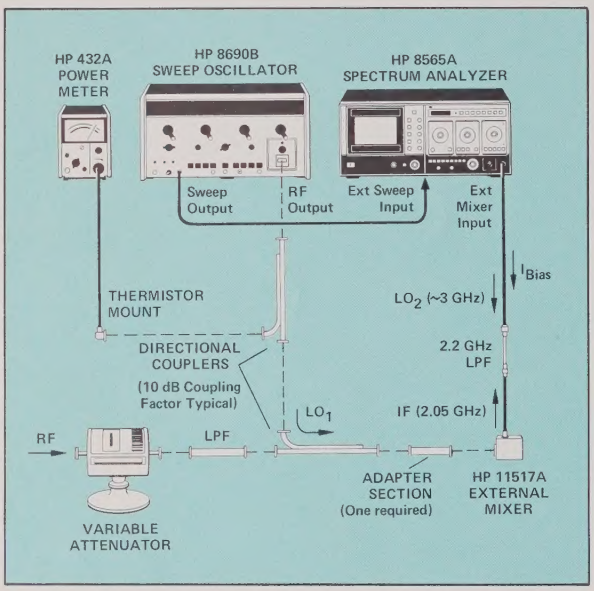


Figure 2. Fundamental mixing set-up.

The sweep oscillator is the heart of the system providing the local oscillator (LO_1) for mixing and the horizontal sweep for the analyzer. The sweeper controls the center frequency, frequency span, and sweep time. With sweepers such as the HP 8690 Series, the START/STOP mode is used for wide frequency spans and the Δf mode is used for narrow frequency spans.

Amplitude calibration is dependent on the frequency span, resolution bandwidth, video filter bandwidth, and sweep time. To check for a calibrated display, increase the sweep time by at least a factor of three. If the amplitude does not change, the display was calibrated. If the amplitude increases, continue increasing the sweep time until the amplitude reaches a maximum.

For best frequency response (flatness), the sweeper's LO power is held to a constant value and monitored with a power meter or an automatic leveling control (ALC) circuit. This LO power is typically adjusted to 0 dBm (1 mW) at the mixer for best sensitivity. Lower power values may be used, but sensitivity is reduced and flatness is worse.

Depending upon the sweep oscillator's sweep output voltage and the spectrum analyzer's sweep input voltage, readjustment of the horizontal CRT trace may be necessary. For instance, when using the HP 8565A analyzer with the HP 8690 Series sweeper, a 100 kΩ potentiometer is used in series between the analyzer and the sweeper to reduce the horizontal sweep voltage. The HP 8555A (8552A/B) analyzer's horizontal gain and position controls will usually eliminate the need for such an interface. See Appendix B for more information on input and output sweep characteristics.

With the spectrum analyzer switched into one of its external mixer bands and an input signal (RF) applied to the mixer, three signals are present at the analyzer's external mixer BNC port: the analyzer's local oscillator (LO_2), the immediate frequency (IF), and the external mixer bias (I_{BIAS}).

Since the sweep oscillator will be providing the local oscillator (LO_1) for the mixer, the spectrum analyzer's local oscillator (LO_2) must be filtered out. This is accomplished by first tuning the analyzer to the middle of the frequency band (setting $LO_2 \simeq 3$ GHz) and then inserting a 2.2 GHz low-pass filter between the analyzer and the mixer.

The RF and LO_1 signals generate two mixing products, equal in amplitude and separated by twice the IF frequency (4.1 GHz), for each RF signal present at the input (neglecting intermodulation and harmonic distortion products). The IF travels to the analyzer, into a 2.05 GHz band-pass filter network in the analyzer, is processed by further filtering and amplification, is detected, and is finally displayed on the CRT. With the analyzer's frequency span control adjusted to 1 MHz/DIV, the signal identifier switch must be used to determine if the RF input signal is 2.05 GHz higher or lower than LO_1. With the analyzer set to a positive (+) IF mixing mode (i.e., 6^+ or 10^+) and a narrow frequency span (use the sweeper's Δf mode), signals which identify with the smaller image to the left are 2.05 GHz lower than LO_1. Signals which identify with the smaller image to the right are 2.05 GHz higher than LO_1. Figure 3 demonstrates this effect.

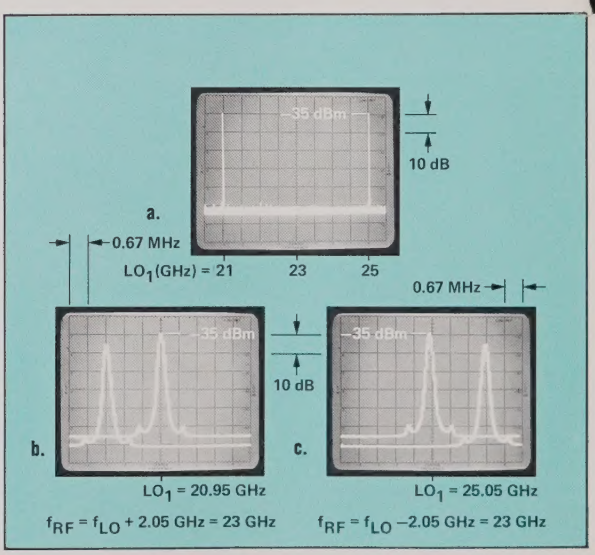


Figure 3. Signal identification using fundamental mixing. (a) shows two signal responses of equal amplitude and separated by 4.1 GHz for a 23 GHz RF input signal. (b) and (c) show how the lower and upper signal responses were identified using the signal identifier switch. This example used a positive (+) analyzer IF mixing mode (i.e., 6^+ or 10^+).

Generally, the signal identifier switch will not give a two-division response. The distance between responses depend on the frequency span selected by the sweep oscillator. Th smaller this is, the further apart the two responses will be. All that is important is the direction the smaller response is from the larger one.

Use of the analyzer's negative (−) IF mixing mode (i.e., 6^- or 10^-), available on some analyzers, will cause the smaller image to identify in the opposite direction from the [illegible] in Figure 3. Thus, if the above rule were applied when using the analyzer's negative (−) IF mixing mode, an error of 4.1 GHz would result.

Harmonic mixing distortion may occur if higher frequency signals present at the RF input port mix with the harmonics of the LO_1. To eliminate these errors, a waveguide low-pass filter is inserted in front of the mixer's waveguide input port. The filter's cutoff frequency should be just above the frequency band under measurement.

Occasionally some spurious signals caused by the analyzer's local oscillator (LO_2) may appear. These spurious signals may be eliminated from the display by adjusting the analyzer's frequency tune control.

CALIBRATION PROCEDURE

The spectrum analyzer may be calibrated to read absolute power using an external RF calibration signal in the frequency range of interest. This is done by using both the INPUT ATTEN control and the REF LEVEL CAL (HP 8555A = AMPL CAL) adjustments on the analyzer. Since the input attenuator is bypassed, it has no effect on the signal but will change the reference level readout. Thus, the INPUT ATTEN control provides a method of calibrating the analyzer to within ±5 dB (attenuator has 10 dB steps) of the calibration signal amplitude. To adjust within the ±5 dB limit, use the REF LEVEL CAL adjustment to bring the display into an absolute power calibration.

The following procedure may be used to calibrate the analyzer in either the harmonic mixing or fundamental mixing modes.

1. INITIALIZE CONTROLS: Calibrate the analyzer as usual using the internal calibration signal. Then, use the control settings given in either the harmonic or fundamental mixing measurement procedure.
2. INPUT SIGNAL: Input an RF calibration signal of known frequency and amplitude. For greatest accuracy, the frequency should be as close to anticipated signals to be measured as possible. If signals are to be measured across the entire frequency band, the calibration frequency should be near the middle of that band. The approximate calibration signal amplitude should be −20 dBm for harmonic mixing or −35 dBm for fundamental mixing.
3. TUNE AND IDENTIFY SIGNAL: See the appropriate measurement procedure sections.
4. ADJUST MIXER BIAS: Adjust the mixer BIAS until the signal reaches its maximum peak. Check the sweep time to insure a calibrated display.
5. BRING SIGNAL NEAR TOP OF CRT: Position the displayed signal as close as possible to the reference level graticule line using only the coarse (10 dB steps) reference level control.
6. COARSE ADJUST: Starting with the analyzer's INPUT ATTEN and reference level fine (vernier) controls set to 0 dB, adjust these controls to make the analyzer's reference level equal to the calibration signal amplitude. In fundamental mixing the reference level and calibration signal amplitude cannot be made equal. In this case it is necessary to note an offset (i.e., 10 dB, 20 dB) to apply to future amplitude measurements.
7. FINE ADJUST: Position the displayed signal on the reference level graticule line using the REF LEVEL CAL adjustment.
8. CALIBRATION COMPLETE: The analyzer is now amplitude calibrated for the frequency band chosen above.

MEASUREMENT PROCEDURE

Harmonic Mixing

Measurements may be made using harmonic mixing with the following procedure.

1. INITIALIZE ANALYZER CONTROLS: Use the set-up in Figure 1, the desired external mixer frequency band, a wide resolution bandwidth (≥ 300 kHz), and a wide frequency span (≥ 200 MHz/DIV).
2. CONNECT SIGNAL: The variable attenuator insures that the mixer's power limitations are not exceeded.
3. TUNE ANALYZER TO SIGNAL: Tune the analyzer to the desired frequency. If a signal response cannot be found, slowly adjust the BIAS until a response appears or decrease the resolution bandwidth for better sensitivity. Reduce the frequency span to 1 MHz/DIV while keeping the signal to be measured centered with the tuning control.
4. IDENTIFY SIGNAL: Identify the signal using the signal identifier switch.
5. ADJUST MIXER BIAS: Adjust the mixer BIAS until the signal reaches its maximum peak. The BIAS should be adjusted for every 500 MHz change of RF input signal frequency or whenever the frequency band is changed.
6. MEASURE SIGNAL: Use the reference level controls to position the signal on the reference level (top CRT graticule line). Record the frequency and amplitude of the signal.

Fundamental Mixing

Measurements may be made using fundamental mixing with the following procedure. If the calibration procedure was not followed, adjust the mixer BIAS on the first measurement. The mixer BIAS only needs to be adjusted once.

1. INITIALIZE CONTROLS: Use the set-up in Figure 2 and set the controls as follows:
   Spectrum Analyzer,
   - frequency band = any positive (+) external mixer band (i.e., 6^+ or 10^+)
   - frequency tune = to middle of above band (setting $LO_2 \simeq 3$ GHz)
   - frequency span = 1 MHz/DIV
   - resolution bandwidth ≥ 300 kHz

   Sweep Oscillator,
   - frequency span = widest possible span
   - sweep time = 5 seconds per sweep
   - power output = 0 dBm (1 mW) at mixer
2. CONNECT SIGNAL: The variable attenuator insures that the mixer's power limitations are not exceeded.
3. TUNE SWEEPER TO SIGNAL: Input signals near the middle of the swept band produce two responses while those near the edge of the band produce only one. Reduce the frequency span using the sweeper's Δf control while keeping the signal to be measured centered with the CW control.
4. IDENTIFY SIGNAL: With the frequency span sufficiently narrow, use the signal identifier switch to determine if the RF input signal is 2.05 GHz higher or lower than the sweep oscillator frequency (LO_1).
5. MEASURE SIGNAL: Check the sweep time to insure a calibrated display. Use the reference level controls to position the signal on the reference level (top CRT graticule line). Record the frequency and amplitude of the signal.

ACCURACY CONSIDERATIONS

Measurement accuracy is dependent upon the spectrum analyzer, the external RF calibration signal, and, in the case of fundamental mixing, the sweep oscillator. The tuning accuracy using harmonic mixing is dependent upon the accuracy of the spectrum analyzer, while in fundamental mixing it is dependent upon the accuracy of the sweep oscillator. The tuning accuracy is typically within 1% of the center frequency for narrow frequency spans. The amplitude accuracy depends upon the analyzer, calibration signal, and the system's frequency response (flatness). The system's frequency response may be eliminated by using RF substitution techniques to achieve amplitude accuracies typically within ±2 dB.

Examples of combined sensitivity and frequency response with the HP 11517A external mixer are given in Figures 4 and 5.

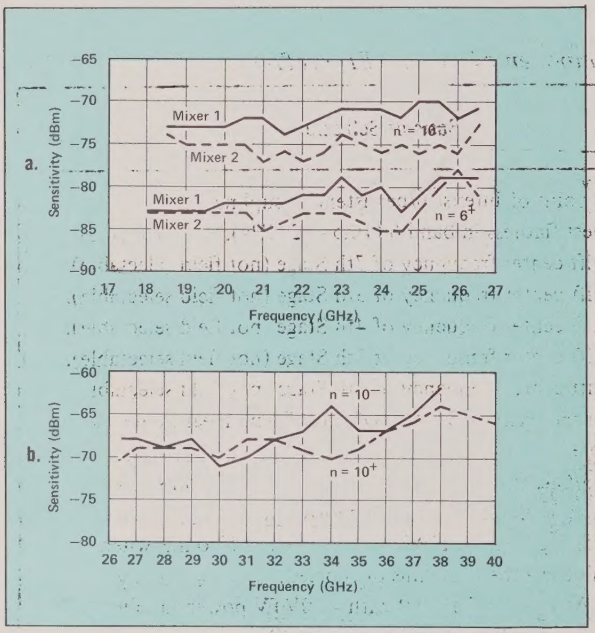


Figure 4. Examples of combined sensitivity and frequency response in a 10 kHz resolution bandwidth using harmonic mixing with an HP 8555A Spectrum Analyzer. (a) compares the sixth and tenth harmonic mixing bands each using two different HP 11517A mixers. The HP 8565 produces similar results. (b) compares the similarity of the analyzer's tenth harmonic mixing bands using the mixer 1. Measurements were made adjusting the mixer BIAS every 500 MHz.

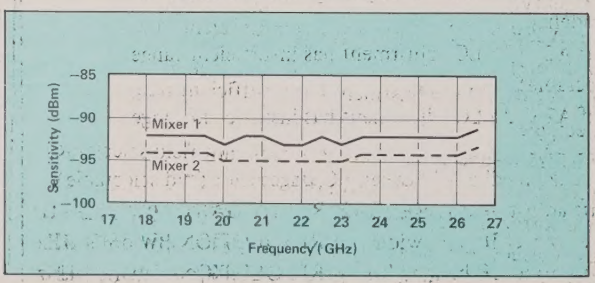


Figure 5. Example of combined sensitivity and frequency response in a 10 kHz resolution bandwidth using fundamental mixing and an HP 8555A Spectrum Analyzer with two different HP 11517A mixers. Other frequency bands yield similar improvements over harmonic mixing.

APPENDIX

A. Recommended Equipment

Following is a brief list of the equipment used in this application note.

Mixer Components

HP Model	Frequency (GHz)	HP Band Designation	Description
11517A	12.4 - 40.0	—	Mixer (adapter required)
11518A	12.4 - 18.0	P	Adapter section
11519A	18.0 - 26.5	K	Adapter section
11520A	26.5 - 40.0	R	Adapter section

Sweep Oscillator

HP Model	Frequency (GHz)	Description
8690A/B	—	Mainframe
8695A[1]	12.4 - 18.0	BWO plug-in
8696A[1]	18.0 - 26.5	BWO plug-in
8697A[1]	26.5 - 40.0	BWO plug-in

Low Pass Filters

HP Model	Passband (GHz)	Stopband (GHz)	Description
360C	≤ 2.2	≥ 2.7	Coaxial LPF
P362A	12.4 - 18.0	23 - 54	Waveguide LPF
K362A	18.0 - 26.5	31 - 80	Waveguide LPF
R362A	26.5 - 40.0	47 - 120	Waveguide LPF

B. Sweep Input/Output Characteristics

Sweep Oscillator
Sweep Output Characteristics

HP Model	Approximate Output Voltage	Nominal Output Impedance
8620	0 to +10 V	10 kΩ
8690	0 to +15 V	10 kΩ

Spectrum Analyzer
Sweep Input Characteristics

HP Model	Approximate Input Voltage	Nominal Input Impedance
8551B/851B	0 to +15 V	100 kΩ
8552A (pre-1970)	0 to +8 V	1 MΩ
8552A/B (mod TG-1)[2]	0 to +8 V	48 kΩ
8565A	0 to +10 V	100 kΩ

[1] To simplify measurements, BWO plug-ins are available as a special option with a 2 GHz frequency offset.

[2] The designation "mod TG-1" will appear on all HP 8552A/B IF sections made subsequent to 1969.

For more information, call your local HP Sales Office or East (301) 948-6370 • Midwest (312) 255-9800 • South (404) 955-1500 • West (213) 877-1282. Or, write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, California 94304. In Europe, Post Office Box, CH-1217 Meyrin 2, Geneva, Switzerland. In Japan, Yokogawa-Hewlett-Packard, 1-59-1, Yoyogi, Shibuya-Ku, Tokyo, 151.

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ERRATA (Cont'd)

Page 4-19, Paragraph 4-12:
Add at end of step c: "Pull to uncouple controls and set RESOLUTION BW to 1 kHz."

Page 5-10, Table 5-2:
Delete entries for A22R23, A22R63, and A22R65.

Page 5-11, Table 5-2:
Delete all entries after A24R55 (Option 100).

Page 5-12, Table 5-2:
Delete all entries preceding A27R3.
Add following entries at end of Table 5-2:

P/O Table 5-2. Factory Selected Components (3 of 3) (ERRATA)

Reference Designator	Adjustment Paragraph	Service Sheet	Performance Test	Basis of Selection
A7VR1	5-16	31		Controls start point of intensity/persistence coupling.
A20R95		19		Selected for best flatness in band 6 (10.5–22 GHz).
A22C18		24		Selected to shift center frequency of 7th Stage (not field selectable).
A22C30		24		Selected to shift center frequency of 3rd Stage (not field selectable).
A22C40		24		Selected to shift center frequency of 4th Stage (not field selectable).
A22C52		24		Selected to shift center frequency of 5th Stage (not field selectable).
A22C67		24		Selected to shift center frequency of 6th Stage (not field selectable).
A22R6		24		Selected for proper gain of Q3, Q4, Q5, and Q6 in linear mode (not field selectable).
A22R35		24		Sets gain of Q3/Q4. Shorted if A22R6 goes below 10 ohms when selected. (Value is either 10 ohms or shorted.)
A22R51		24		Sets gain of Q5/Q6. Shorted if A22R6 goes below 10 ohms when selected. (Value is either 10 ohms or shorted.)
A22R73		24		Selected for −9 to −10.5V at TP9 with −10VTV power supply adjusted. (Value is either 10 ohms or shorted.)
A23C16	5-20	23		Selected to shift adjustment range of A23C15.
A23C20	5-20	23		Selected to shift adjustment range of A23C23.
A23C39	5-20	23		Selected to shift adjustment range of A23C38.
A23C43	5-20	23		Selected to shift adjustment range of A23C45.
A23R3	5-18			Selected for proper input level to Log Amplifier Assembly to improve log fidelity.
A23R24		23		Selected only if A23R26 LC adjustment has insufficient range (not field selectable).
A23R25		23		Selected only if A23R26 LC adjustment has insufficient range (not field selectable).
A23R56		23		Selected to equalize feedback between LC stages (not field selectable).
A25R48	5-33	37	4-21	Selected to shift adjustment range of A25R20 DC GAIN.
A26R7	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R9	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R10	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R17	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R18	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.

Page 5-12, Table 5-2 (Cont'd):

P/O Table 5-2. Factory Selected Components (3 of 3) (ERRATA) (Cont'd)

Reference Designator	Adjustment Paragraph	Service Sheet	Performance Test	Basis of Selection
A26R19	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R20	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R27	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R28	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R29	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R30	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R36	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R37	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R39	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R40	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R45	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R46	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R48	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R49	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R54	5-33	38	4-21	Selected for .3 kHz RESOLUTION BW signal amplitude same as 1 kHz RESOLUTION BW signal amplitude.
A26R64	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A27C16	5-20	21		Selected to shift adjustment range of A27C15.
A27C20	5-20	21		Selected to shift adjustment range of A27C23.
A27C39	5-20	21		Selected to shift adjustment range of A27C38.
A27C44	5-20	21		Selected to shift adjustment range of A27C45.
A27C64	5-20	21	4-21	Selected to maintain same amplitude (±0.1 dB) when switching from 3 MHz to 100 kHz RESOLUTION BW.
A27R24		21		Selected only if A27R26 LC adjustment has insufficient range (not field selectable).
A27R25		21		Selected only if A27R26 LC adjustment has insufficient range (not field selectable).
A27R56		21		Selected to equalize feedback between LC stages (not field selectable).
A28R6		20		Selected to shift adjustment range of A28R7.
A28R32		20		Selected to minimize distortion if necessary (not field selectable).
A28R33		20		Selected to minimize distortion if necessary (not field selectable).
A36A1C12		16		Selected to correct sensitivity error of differential comparator (not field selectable).
A36A1R14		16		Selected to correct sensitivity error of differential comparator (not field selectable).
A36A2C8	5-28	16		Selected to shift adjustment range of A36A2C16.
A36A2C18	5-28	16		Selected to shift adjustment range of A36A2C16.
A36A2R26		16		Selected to shift adjustment range of A36A2R27 (not field selectable).

ERRATA (Cont'd)

Page 5-19, Paragraph 5-13:
Add before step d:

WARNING

High voltage is present at the following test point.

Change step d to read: "Set digital voltmeter to 10V range and measure output of high-voltage CRT cathode power supply on board assembly A8 HVTP (TP1)."

Page 5-20, Paragraph 5-13:
Delete step i. Add following sentence to step m: "Depress INT SWEEP SOURCE pushbutton to return 8565A to internal sweep."
Add before step j:

WARNING

The test point near the top of board assembly A8 has 3000V present and should not be used for the Intensity Limit adjustment.

In step l, change "A8TP1" to "A8TP2."

Page 5-33, Paragraph 5-18:
Add the following note at the end of step b:

NOTE

If Option 100 is installed, connect 20 dB attenuator between step attenuator and analyzer INPUT.

Page 5-35, Paragraph 5-18:
Add before step m:

NOTE

If Option 100 is installed, remove 20 dB attenuator, set REF LEVEL to −10 dBm, and adjust REF LEVEL CAL for a digital voltmeter reading of 800 mV plus offset ±1 mV.

Page 5-36, Paragraph 5-18:
In step w, change "0 dB" to "10 dB."

Page 5-41, Figure 5-22:
In A23/A27 board illustration change following callouts:
"R31 LC" should be "R31 XTL," and "R26 XTL" should be "R26 LC."

Page 5-43, Paragraph 5-20:
Change "A23TP3" at end of first sentence in step n-5 to "A23TP6."

ERRATA (Cont'd)

Page 5-45, Paragraph 5-20:
Change "200 kHz" in third line of step z to "200 MHz."
Change "1 MHz" to "1 kHz" RESOLUTION BW in fourth line of step ab.

Page 5-48, Paragraph 5-21:
Add to control settings in step c: "INPUT ATTEN . . . 0 dB."

Page 5-49, Paragraph 5-21:
Change step j to read: "Disconnect signal generator from step attenuator and record offset voltage at A21TP5."
Change first sentence of step k to read: "Reconnect signal generator and set output level to 0 dBm."
Change step m to read: "Adjustment complete. Set LINE switch OFF, disconnect power cord, remove extender boards, and install A21 Video Assembly, A28 Variable Gain Amplifier Assembly, and 8565A top cover."

Page 5-49, Table 5-9:
Change "Reference ±20 mV" to "Reference ±5 mV" in five places.

Page 5-52, Paragraph 5-22:
Add the following setting to step g: SWEEP TRIGGER . . . EXT.

Page 5-75, Paragraph 5-28:
Delete note before step r.

Page 5-94, Paragraph 5-31, step x:
Change sentence following reference to Figure 5-59 to read: "Using REF LEVEL CAL and REFERENCE LEVEL FINE, set the best line at the center horizontal graticule line."

Page 5-95, Figure 5-59:
Delete Figure 5-59 and replace with new Figure 5-59 in this Manual Changes supplement.

Page 5-100, Paragraph 5-33:
Delete Figure 5-62 and replace with Figure 5-62 in this Manual Changes supplement.
Add to EQUIPMENT:

Spectrum Analyzer	HP 140T/8552B/8553B
Tracking Generator	HP 8443B
DC Power Supply	HP 6214A
10:1 Divider Probe	HP 10004D
BNC Tee	HP 1250-0781
Cable	HP 11592-60001

Pages 5-102 through 5-104:
Delete entire PROCEDURE section of **5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS** and replace with following PROCEDURE section:

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

PROCEDURE:

a. Set LINE switch OFF and disconnect power cord. Remove 8565A top cover and right-hand side cover.

b. Reconnect power cord and set LINE switch ON. Remove green coax cable (W22) from A29J6 21.4 MHz IF input to A28 Variable Gain Assembly. A29J6 is located on right-hand side of 8565A near rear of instrument. Connect equipment as shown in Figure 5-62 and set controls as follows:

8565A
- FREQUENCY BAND GHz ..... .01 – 1.8
- INPUT ATTEN ..... 0 dB
- REF LEVEL ..... 0 dBm
- REF LEVEL FINE 0
- RESOLUTION BW ..... 3 kHz
- AMPLITUDE SCALE ..... LIN
- SCAN TIME/DIV ..... 20 mSEC

8443A
- RF OUTPUT LEVEL ..... –25 dBm
- POWER ..... ON
- FUNCTION ..... TRACK ANALYZER

8552B
- SCAN MODE ..... EXT

8553B
- BANDWIDTH ..... 10 kHz
- SCAN WIDTH ..... .5 kHz/DIV
- FREQUENCY ..... 21.4 MHz

c. Adjust dc power supply to center the scan on the 140-series spectrum analyzer. Adjust oscilloscope to center the external horizontal sweep.

d. Set 8565A RESOLUTION BW to 3 kHz and adjust REF LEVEL controls to place peak of signal approximately at sixth graticule line. Adjust 8553B FREQUENCY FINE TUNE control to center signal on 8565A CRT display.

e. Connect 1:1 divider probe to A26TP3 (Figure 5-63) and set 8565A RESOLUTION BW to 1 kHz.

NOTE

A non-metallic tuning tool is required for all crystal filter and LO adjustments.

In the following steps, keep signal centered on 8565A CRT display by adjusting 8553B FREQUENCY FINE TUNE control as necessary with 8565A RESOLUTION BW set to 3kHz.

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

f. Adjust A26C3 CTR for minimum signal amplitude on oscilloscope display.

g. Adjust A24C35 F_0 100 Hz BW to center signal on oscilloscope display.

h. Repeat steps f and g until no further adjustment is necessary.

i. Adjust A26C2 SYM and A26C3 CTR for a centered and symmetrical bandpass on oscilloscope dsiplay.

j. Connect oscilloscope 1:1 divider probe to A26TP5 and adjust A26C12 SYM and A26C13 CTR for a centered and symmetrical bandpass on oscilloscope display.

k. Connect oscilloscope 1:1 divider probe to A26TP7 and adjust A26C19 SYM and A26C20 CTR for a cenetered and symmetrical bandpass on oscilloscope display.

l. Connect oscilloscope 1:1 divider probe to A26TP9 and adjust A26C25 SYM and A26C26 CTR for a centered and symmetrical bandpass on oscilloscope display.

m. Disconnect oscilloscope probe and adjust A26C32 SYM and A26C33 CTR for a centered and symmetrical bandpass on 8565A spectrum analyzer CRT display.

n. Check that 8565A RESOLUTION BW is set to 1 kHz. Disconnect signal from tracking generator and reconnect W22 to A29J6. Set INPUT ATTEN to 0 dB, REF LEVEL to −50 dBm, REF LEVEL FINE to −12, FREQUENCY SPAN MODE to ZERO SPAN, and SCAN TIME/DIV to 1 mSEC.

o. Connect oscilloscope 10:1 divider probe to A23TP1 in the Bandwidth Filter No. 2 Assembly and adjust A25C24 LO NULL for minimum signal amplitude on oscilloscope. Disconnect 10:1 divider probe from 8565A.

p. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector. Set 8565A REF LEVEL to 0 dBm, RESOLUTION BW to 1 MHz, FREQUENCY SPAN MODE to PER DIV, SCAN TIME/DIV to AUTO, and FREQUENCY SPAN/DIV to 1 MHz.

q. Adjust REF LEVEL FINE control to set 100 MHz signal peak on fifth graticule line.

r. Set RESOLUTION BW to 1 kHz and FREQUENCY SPAN/DIV to 1 kHz (center signal on CRT). Adjust A25R20 DC GAIN to set 100 MHz signal peak on fifth graticule line. If adjustment does not have enough range, change value of factory selected resistor A25R48*. An increase in resistance increases signal amplitude.

s. Set RESOLUTION BW to .1 kHz and SWEEP SOURCE to MAN. Adjust MANUAL SWEEP control for maximum amplitude on display. Adjust A26R53 100 Hz GAIN to set 100 MHz signal peak on fifth graticule line.

3 dB BANDWIDTH VERIFICATION:

t. Set RESOLUTION BW to 1 kHz, FREQUENCY SPAN/DIV to 1 kHz, and AMPLITUDE SCALE to LIN. Connect frequency counter to rear panel 21.4 MHz IF OUTPUT connector.

u. Adjust REF LEVEL FINE control to set 100 MHz signal peak 7.1 divisions above bottom graticule line.

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

NOTE

When signal peak is set to 7.1 divisions, the 3 dB bandwidth points are located five divisions above the bottom graticule line.

v. Measure 3 dB bandwidths for each RESOLUTION BW listed in Table 5-12 as follows:

1. Set SWEEP SOURCE to MAN.

2. Adjust MANUAL SWEEP control to position trace on lower frequency 3 dB point. Note frequency counter indication.

Frequency_____ MHz

3. Adjust MANUAL SWEEP control to position trace on upper frequency 3 dB point. Note frequency counter indication.

Frequency_____ MHz

4. Subtract frequency noted in step 2 from frequency noted in step 3. This frequency difference is the 3 dB bandwidth; check that it is within the 3 dB bandwidth limits listed in Table 5-12.

5. If the 1 kHz RESOLUTION BW is out of tolerance, change the values of factory-selected resistors listed in Table 5-12. These resistors must be changed in pairs (shown by parentheses), and the parallel resistance of any pair should not vary more than 10 percent from the parallel resistance of any other pair.

6. If the .3 kHz or .1 kHz RESOLUTION BW is out of tolerance, change the values of the factory-selected resistors listed in Table 5-12. Each resistor in a set must have a value within 10 percent of the other resistors.

w. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top and side covers.

Table 5-12. Factory-Selected Resistors

Resolution BW	Factory-Selected Resistors	3 dB BW Limits
1 kHz	(A26R9, A26R10), (A26R19, A26R20), (A26R29, A26R30), (A26R39, A26R40), (A26R49, A26R48)	0.8 to 1.2 kHz
.3 kHz	A26R7, A26R18, A26R28, A26R37, A26R46	255 to 345 Hz
.1 kHz	A26R17, A26R27, A26R36, A26R45, A26R64	85 to 115 Hz

ERRATA (Cont'd)

Page 5-103, Paragraph 5-33:
Change A23TP1 to A23TP11 in step o.
Change factory selected resistor in third line of step r to A25R48.

Page 6-1, Paragraph 6-7:
Change paragraph to read: "To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number (with the check digit), indicate the quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order."

Page 6-4, Table 6-2:
Change A1MP7 through A1MP12 to HP Part No. 08565-60170, Check Digit 5, KNOB ASSY, SMALL POT.
Delete all entries for A1MP13 through A1MP18 and change description to "NOT ASSIGNED."
Delete all entries for A1MP31 through A1MP42 and change description to "NOT ASSIGNED."

Page 6-5, Table 6-2:
Change A1A2R9 to 0757-0428; RESISTOR 1.62K 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-1621-F.
Add second entry for A2; 08565-60126; FRONT PANEL SWITCH REPLACEMENT ASSEMBLY, INCLUDES A2A1, A2A4, A2A6, and ASSOCIATED MECHANICAL PARTS. (DOES NOT INCLUDE A2A2, A2A3, FRONT PANEL, AND KNOBS.)

Page 6-6, Table 6-2:
Change A2MP67 HP Part Number and Mfr Part Number to 08558-20053.

Page 6-8, Table 6-2:
Change A2A1DS1 and A2A1DS2 to HP Part Number 1990-0717, Check Digit 6, LED-VISIBLE LUM-INT-800UCD IF=30MA-MAX.
Change A2A1DS3 to HP Part Number 1990-0718, Check Digit 7, LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX.
A2A3, HP Part Number 08565-60006, ASSEMBLY, TUNING: For recommended replacement, see CHANGE 18.

Page 6-9, Table 6-2:
Change A2A3R3 to 2100-3726; RESISTOR-VAR PREC W/CP 5-TRN 20K 10%; 28480; 2100-3726.

Page 6-11, Table 6-2:
Change A5C12, C13, C14, and C15 to 0160-3665; CAPACITOR-FXD .01UF +80 –20% 500 VDC CER; 28480; 0160-3665.

Page 6-13, Table 6-2:
Add A7C22; 0160-0127; CAPACITOR-FXD 1UF +–20% 25 VDC CER.

Page 6-14, Table 6-2:
Change A7R40 to 0698-3444, RESISTOR 316 1% .125W F TC=0+–100.
Change A7VR1 to A7VR1* FACTORY SELECTED PART.
Add A7VR4, 1902-0668, DIODE-ZNR 200V 5% .4W, 28480, 1902-0668.
Add A8CR6, HP Part Number 1901-0033, Check Digit 2, DIODE-GEN PRP 180V 200MA DO-7.

Page 6-15, Table 6-2:
Change A8R12 to 0698-8994, RESISTOR 8.25M 5% 1W, 28280, 0698-8994.
Change A8R14 to 0698-8995, RESISTOR 10M 5% 1W, 28480, 0698-8995.
Add A8R18, 0683-4745, RESISTOR 470K 5% .25W TC=–800/+900, 0160G, CB4745.
Change A9C3 to 0160-4204; CAPACITOR-FXD .033UF +–10% 500 VDC CER.
Change A9CR1 and CR2 HP Part Number and Mfr Part Number to 1901-0743.
Change A9MP1 HP Part Number and Mfr Part Number to 1205-0011.

ERRATA (Cont'd)

Page 6-18, Table 6-2:
Change A12R3 to 0698-8824, RESISTOR 562K 1% .125W F TC=0+–100; 28480, 0698-8824.

Page 6-19, Table 6-2:
Change A13CR18, CR21, and CR23 HP Part Number and Mfr Part Number to 1901-0743.

Page 6-20, Table 6-2:
Change description for A14C19 to read: CAPACITOR-FXD .01UF +80 –20% 100 VDC CER (FACTORY SELECT PART; ALTERNATE VALUE: HP Part Number 0160-0575, .047UF 50 VDC CER).

Page 6-24, Table 6-2:
► Change A16C4 to HP Part Number 0160-2262, Check Digit 0, CAPACITOR-FXD 16 PF +–5% 500 VDC CER, 28480, 0160-2262.
Add A16C27, 0160-3451, CAPACITOR-FXD .01UF +80 –20% 100 VDC CER, 28480, 0160-3451.

Page 6-33, Table 6-2:
Change A19MP2 to HP Part Number 0340-0416, Check Digit 4, INSULATOR-XSTR THERMA-FILM.

Page 6-34, Table 6-2:
Change A19R37 to A19R37*. Add to description: (MIGHT BE LOADED AS OPEN.)
Change A19R40 to A19R40*. Add to description: (MIGHT BE LOADED AS OPEN.)
Change A19R43 to A19R43*. Add to description: (MIGHT BE LOADED AS OPEN.)
Change A19R46 to A19R46*.
Change A19R49 to A19R49*.

Page 6-35, Table 6-2:
Change A20R3 to HP Part Number 2100-1739, Check Digit 0, RESISTOR-TRMR 5K 10% WW SIDE-ADJ 20-TRN, 0374D, 3005P-1-502.
Change A20R5 to HP Part Number 2100-2851, Check Digit 9, RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN, 0374D, 3005P-1-203.

Page 6-36, Table 6-2:
Change A20R29 to A20R29*, 0757-0400, RESISTOR 90.9 1% .125W F TC=0+–100 FACTORY SELECTED PART, 0329B, C4-1/8-TO-90R9-F.
Change A20R95 to A20R95*, FACTORY SELECTED PART.

Page 6-38, Table 6-2:
Add A21E2 and A21E3, HP Part Number 9170-0029, Check Digit 3, CORE-SHIELDING BEAD, 0188G, 56-590-65A2/4A.

Page 6-41, Table 6-2:
Add A21E2 and A21E3, HP Part Number 9170-0029, Check Digit 3, CORE-SHIELDING BEAD, 0188G, 56-590-65A2/4A.

Page 6-45, Table 6-2 (Applicable Log Ampl Part 08565-60111 only):
Add asterisk (*) after each of the following reference designations: A22C18, C30, C52, and C67.

Page 6-46, Table 6-2 (Applicable Log Ampl Part 08565-60111 only):
Change A22CR5, CR6, and CR7 HP Part Number and Mfr Part Number to 1901-0040.
Change A22CR14, CR26, and CR29 HP Part Number and Mfr Part Number to 1901-0047.
► Add A22C79, HP Part Number 0180-0197, Check Digit 8, CAPACITOR-FXD 2.2UF +–10% 20 VDC TA, 0420J, 150D225X9020A2.

ERRATA (Cont'd)

Page 6-47, Table 6-2 (Applicable Log Ampl Part 08565-60111 only):

► Change A22Q25 to HP Part Number 1854-0637, Check Digit 1, TRANSISTOR NPN, 28480, 1854-0637.
Add asterisk after each of the following reference designations: A22R6, R8, R16, R35, R46, R51, and R64.
Delete asterisks after A22R49 and R65.
Delete "*FACTORY SELECTED PART" in description for A22R49 and R65.
Change A22R64* to HP Part Number 0698-3153, Check Digit 9, RESISTOR 3.83K 1% .125W F TC=0+–100.

Page 6-48, Table 6-2 (Applicable Log Ampl Part 08565-60111 only):

Delete asterisk after A22R69.
Delete "*FACTORY SELECTED PART" in description for A22R69.
Add asterisk after each of the following reference designations: A22R73, R74, R82, R102, R119, R130.
Change A22R130* to HP Part Number 0757-0463, Check Digit 4, RESISTOR 82.5K 1% .125W F TC=0+–100.

Page 6-49, Table 6-2:

Add asterisk after each of the following reference designations: A23C16, A23C20, A23C39, A23C43, A23C44, A23C63, A23C64.
Change A23C16*, A23C20*, A23C43*, and A23C64* to HP Part Number 0160-0134, Check Digit 1, CAPACITOR-FXD 220PF +–5% 300VDC MICA.

Page 6-50, Table 6-2:

Add asterisk after each of the following reference designations: A23R3, R7, R19, R23, R24, and R25.

Page 6-51, Table 6-2:

Add asterisk after each of the following reference designations: A23R43, R49, and R56.
Add A23TP1, A23TP2, A23TP4, and A23TP5, HP Part Number 0360-1788, Check Digit 7, CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ.
Add A23TP3, and A23TP6 through A23TP12, HP Part Number 1251-0600, Check Digit 0, CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ.

Page 6-53, Table 6-2:

Add A24CR1 and A24CR2, HP Part Number 1901-0040, Check Digit 1, DIODE-SWITCHING 30V 50MA 2NS DO-35.
Add A24CR3 through A24CR6, HP Part Number 1901-1070, Check Digit 9, DIODE-PIN.
Add A24CR7, HP Part Number 1901-0040, Check Digit 1, DIODE-SWITCHING 30V 50MA 2NS DO-35.

Page 6-54, Table 6-2:

Change A24R10 to NOT ASSIGNED.
Change A24R55 to A24R55*.
Change A25C6 to HP Part Number 0160-2209, Check Digit 5, CAPACITOR-FXD 360PF 300VDC MICA.

Page 6-55, Table 6-2:

Change A25C15 to NOT ASSIGNED.
Change A25C16 to HP Part Number 0160-2055, Check Digit 9, CAPACITOR-FXD .01UF +80–20% 100VDC CER.
Change A25L1 to HP Part Number 9100-1610, Check Digit 3, COIL-MLD 150NH 20% Q=50 .155DX.375LG.
Change A25L5 to HP Part Number 9100-1617, Check Digit 0, COIL-MLD 3.9UH 10% Q=33 .155DX.375 LG.
Change A25L6 to HP Part Number 9140-0111, Check Digit 1, COIL-MLD 3.3UH 10% Q=33 .155DX.375LG.
Change A25R2 to HP Part Number 0757-0279, Check Digit 0, RESISTOR 3.16K 1% .125W F TC=0+–100.

ERRATA (Cont'd)

Page 6-56, Table 6-2:

Change A25R14 to HP Part Number 0757-0405, Check Digit 4, RESISTOR 162 1% .125W F TC=0+–100.
Change A25R15 to HP Part Number 0757-0434, Check Digit 2, RESISTOR 10 1% .125W F TC=0+–100.
Change A25R20 to HP Part Number 2100-3123, Check Digit 0, RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN.
Change A25R21 to HP Part Number 0757-0401, Check Digit 0, RESISTOR 100 1% .125W F TC=0+–100.
Change A25R26 to HP Part Number 0698-3440, Check Digit 7, RESISTOR 196 1% .125W F TC=0+–100.
Change A25R28 to HP Part Number 0757-0346, Check Digit 2, RESISTOR 10 1% .125W F TC=0+–100.
Change A25R29 to HP Part Number 0757-0405, Check Digit 4, RESISTOR 162 1% .125W F TC=0+–100.
Change A25R37 to HP Part Number 0698-3444, Check Digit 1, RESISTOR 316 1% .125W F TC=0+–100.
Change A25R39 to HP Part Number 0698-8821, Check Digit 8, RESISTOR 5.62 1% .125W F TC=0+–100.
Change 25R41 to A25R41.
Change A25R44 to HP Part Number 0698-3442, Check Digit 9, RESISTOR 237 1% .125W F TC=0+–100.
Change A25R46 to HP Part Number 0698-3433, Check Digit 8, RESISTOR 28.7 1% .125W F TC=0+–100.
Change A25R48 to A25R48*.

Page 6-57, Table 6-2:

Add asterisk after each of the following reference designations: A26R7, A26R9, A26R10, A26R17, A26R18, A26R19, and A26R20.
Change A26R7* to HP Part Number 0757-0278, Check Digit 9, RESISTOR 1.78K 1% .125W F TC=0+–100.

Page 6-58, Table 6-2:

Add asterisk after each of the following reference designations: A26R27, A26R28, A26R29, A26R30, A26R36, A26R37, A26R39, A26R40, A26R45, A26R46, A26R48, and A26R49, A26R54, and A26R64.
Change A26R17*, A26R27*, A26R36*, A26R45*, and A26R64* to HP Part Number 0757-0415, Check Digit 6, RESISTOR 475 1% .125W F TC=0+–100.
Change A26R18*, A26R28*, A26R37*, and A26R46* to HP Part Number 0757-0278, Check Digit 9, RESISTOR 1.78K 1% .125W F TC=0+–100.
Change A26R53 to HP Part Number 2100-2521, Check Digit 0, RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN.
Change A26R56 to HP Part Number 0757-0401, Check Digit 0, RESISTOR 100 1% .125W F TC=0+–100.
Add A26R66 and A26R67, HP Part Number 0698-3450, Check Digit 9, RESISTOR 42.2K 1% .125W F TC=0+–100.

Page 6-59, Table 6-2:

Add asterisk after each of the following reference designations: A27C16, A27C20, A27C39, A27C44, A27C63, and A27C64.
Change A27C16*, A27C20*, and A27C43*to HP Part Number 0160-0134, Check Digit 1, CAPACITOR-FXD 220PF +–5% 300VDC MICA.
Change A27C64* to HP Part Number 0160-2208, Check Digit 4, CAPACITOR-FXD 330PF +–5% 300VDC MICA (FACTORY SELECTED PART).

Page 6-60, Table 6-2:

Add asterisk after A27R3, A27R7, A27R19, A27R23, A27R24, and A27R25.
Change A27R19* to HP Part Number 0757-0438, Check Digit 3, RESISTOR 5.11K 1% .125W F TC=0+–100.

ERRATA (Cont'd)

Page 6-61, Table 6-2:

Add asterisk after each of the following reference designations: A27R43, A27R48, and A27R56.

Add A27TP1, A27TP2, and A27TP5, HP Part Number 0360-1788, Check Digit 7, CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ.

Add A27TP3, and A27TP6 through A27TP12, HP Part Number 1251-0600, Check Digit 0, CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ.

Page 6-62, Table 6-2:

Add asterisk after A28R2 and R6.

Change A28R15 to HP Part Number 0698-0082, Check Digit 7, RESISTOR 464 1% .125W F TC=0+–100, 0329B, C4-1/8-TO-464-F. (Refer to CHANGE 18.)

Change A28R21* to HP Part Number 0698-3432, Check Digit 7, RESISTOR 26.1 1% .125W F TC=0+–100.

Change A28R23* to HP Part Number 0698-8819, Check Digit 4, RESISTOR 3.83 1% .125W F TC=0+–100.

Page 6-63, Table 6-2:

► Change A29J5 to HP Part Number 1251-7022, Check Digit 4, CONNECTOR 10-PIN, 28480, 1251-7022.

Under A31, delete listing for HP Part Number 5086-7258.

Under A31, add HP Part Number 08565-60161, Check Digit 3, YTO REPLACEMENT KIT.

Page 6-64, Table 6-2:

Change A35A1C3 to HP Part Number 0160-4959, Check Digit 6, CAPACITOR-FDTHRU 10 PF 5% 200V CER.

Page 6-65, Table 6-2:

Change A36A1C11 to HP Part Number 0160-2220, Check Digit 0, CAPACITOR-FXD 1200PF +–5% 300 VDC MICA.

Page 6-66, Table 6-2:

Change A36A1L4 to HP Part Number 9140-0318, Check Digit 0, INDUCTORRF-CH-MLD 338UH 1% .155DX.375LG.

Add asterisk after A36A1R14.

Change A36A2C8* to HP Part Number 0160-5114, Check Digit 7, CAPACITOR-FXD 240PF 300 VDC GLS.

Page 6-67, Table 6-2:

Change A36A2Q1 through A36A2Q3 to HP Part Number 1854-0404, Check Digit 0, TRANSISTOR NPN SI TO-18 PD=360MW (Recommended Replacement).

Change A36A2R26* to HP Part Number 0757-0460, Check Digit 1, RESISTOR 61.9K 1% .125W F TC=0+–100 (FACTORY SELECTED PART).

Page 6-74, Table 6-2:

Change A40A2CR4, A40A2CR9, A40A2CR14, A40A2CR30, A40A2CR34, and A40A2CR38 to HP Part Number 1901-0734, Check Digit 0, DIODE-PWR RECT 1N5818 30V A1 DO-41.

Change A40A2CR19 and A40A2CR24 to HP Part Number 1901-0743, Check Digit 1, DIODE-PWR RECT 1N4004 400V 1A DO-41.

Page 6-75, Table 6-2:

Change A40A2CR42 to HP Part Number 1901-0743, Check Digit 1, DIODE-PWR RECT 1N4004 400V 1A DO-441.

Change A40A2DS1 through A40A2DS4 and A40A2DS6 through A40A2DS9 to HP Part Number 1990-0178, Check Digit 7, LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX.

Change A40A2MP9 second line of description to read, "(FOR Q5 THRU Q9)".

Change A40A2Q8 to HP Part Number 1854-0311, Check Digit 8, TRANSISTOR NPN 2N4240 SI TO-66 PD=35W.

ERRATA (Cont'd)

Page 6-77, Table 6-2:
Change A41C1 to HP Part Number 0160-4065, Check Digit 5, CAPACITOR-FXD .1UF +–20% 250 VAC (RMS).
Change A41C3 to HP Part Number 0160-2636, Check Digit 2, CAPACITOR-FXD 470PF +–20% 3K VDC CER.

Page 6-78, Table 6-2:
Delete part number of L1 and change description to read: COIL ASSEMBLY, ALIGNMENT (P/O ASSEMBLY, CRT SHIELD, HP PART NO. 08565-60172).
Delete part number of L2 and change description to read: COIL ASSEMBLY, ORTHOGONALITY (P/O ASSEMBLY, CRT SHIELD, HP PART NO. 08565-60172).
Change HP Part Number of S2 to 3101-2188.

Page 6-79, Table 6-2:
Change W38 HP Part Number and Mfr Part Number to 8120-2594.
Change W39 HP Part Number and Mfr Part Number to 8120-2595.
Under Miscellaneous Parts, delete HP Part No. 9320-3714, 8565A INSTRUMENT (PULL-OUT) CARD.
Add HP Part Number 08565-90023, Check Digit 0, INFORMATION CARD, ENGLISH.
Add HP Part Number 08565-90024, Check Digit 1, INFORMATION CARD, JAPANESE.
Add HP Part Number 08565-90025, Check Digit 2, INFORMATION CARD, FRENCH.
Add HP Part Number 08565-90026, Check Digit 3, INFORMATION CARD, GERMAN.

Page 6-80, Table 6-2:
Delete entire line for 08565-00041 and 08565-00067.
Delete HP Part Number 08565-00068.
Add HP Part Number 08565-60172, Check Digit 7, ASSEMBLY, CRT SHIELD (INCLUDES L1 AND L2).
Change description of HP Part Number 08565-20093 to "CIRCUIT ENCLOSURE, 4-TAP."
Change description of HP Part Number 08565-20096 to "CIRCUIT ENCLOSURE, 8-TAP."
Add HP Part Number 8120-2625, Check Digit 3, FAN CORD.

Page 8-7, Paragraph 8-21:
Insert WARNING immediately before step g:

WARNING

If an attempt is made to repair the clutch mechanism of A2A3 Tuning Assembly, HP Part No. 08565-60006, use extreme care. Ball bearings under spring tension could cause serious injury if they are suddenly released when the clutch mechanism is disassembled.

Page 8-28, Figure 8-8:
Change pin numbers of A2A1J1 as follows: 1 to 2, 4 to 1, 47 to 50, and 50 to 49.
Change pin numbers of A2A1J2 as follows: 1 to 2, 4 to 1, 31 to 34, and 34 to 33.

Page 8-41, Figure 8-27, Service Sheet 10:
Add C27 .02 μF in Block (A) between pins 6 and 7 of U2B.
Change "last used" in note 10 to C27.
In function block (D), the unnumbered transistor to the left of Q14 is Q13.
► Change C4 in block (D) (across U3 pins 1 and 8) to 16PF.

ERRATA (Cont'd)

Page 8-53, Figure 8-36:
Change value of R35 to 23.7.
Change R37, R40, and R43 to R37*, R40*, and R43*. Add note: MIGHT BE LOADED AS OPEN.
Change R46 and R49 to R46* and R49*.

Page 8-56, Figure 8-39:
Add R89 between R58 and R83.

Page 8-57, Figure 8-40:
Change A14C19 to C19* (factory select part).

Page 8-61, Figure 8-46:
Change value of A36A1C11 to 1200 pF.
Change value of A36A1L4 to 338 μH.
Add NOTE 9: ALTERNATE A36A2C8* IS HP PART NUMBER 0160-5115, GLASS, 270 PF.
Change value of A36A2R26* to 61.9K.

Page 8-71, Figure 8-56, Service Sheet 19:
Change R29 in block (I) (output of U6B) to R29* 90.9 ohms.

Page 8-73, Figure 8-59, Service Sheet 20:
Change value of R21* to 26.1.
Change value of R23* to 3.83.

Page 8-75, Figure 8-63, Service Sheet 21:
Delete asterisk after R19 in block (D).
Add asterisk after R24 and after R25 in block (D).
Change C44* in block (G) to 110 pF.
Change value of A27C64* to 330 pF.

Page 8-79, Figure 8-69, Service Sheet 23:
Add asterisk after R24 and after R25 in block (D).
Change C43* in block (G) to 110 pF.
Change C34* in block (H) (near Q8) to C39*.

Page 8-81, Figure 8-72, Service Sheet 24 (Applicable Log Ampl Part 08565-60111 only):
Delete asterisk after R23 in block (B).
Add asterisk after R35 in block (B).
Add asterisk after C30 and after R51 in block (C).
Change value of R64* to 3830.
Delete asterisk after R65 in block (D).
Add asterisk after C40 and after R73 in block (D).
Add asterisk after C52 and after R82 in block (E).
Add asterisk after C67 in block (F).
Add asterisk after C18 in block (G).
Add asterisk after R64 in block (L).
Delete asterisk after R63 in block (L).
Change R30* in block (L) (U1B pin 3) to R130*.
Change value or R130* to 82.5K.
► Add C79, 2.2 UF, between collector of Q25 and ground in block (L). Connect + side of capacitor to ground.

ERRATA (Cont'd)

Pages 8-84 and 8-85, Figure 8-77:
Delete two-sheet schematic and replace with the following two-sheet schematic in this Manual Changes supplement: Figure 8-77. A29 RF-IF Motherboard, Schematic Diagram (1 of 2) (ERRATA) and Figure 8-77. A29 RF-IF Motherboard, Schematic Diagram (2 of 2) (ERRATA).

Page 8-95, Figure 8-90, Service Sheet 31:
Add VR 200V zener diode in block (M) with cathode connected to +158V supply and anode connected to assembly ground.
Add connection from Q10 collector to pin 3 of U3A in block (A) .
Change value of R40 in block (A) to 316.

Page 8-110, Figure 8-104:
Interchange pin numbers 1 and 17 on AUX A connector.

Page 8-115, Figure 8-109, Service Sheet 37:
Add asterisk after R48 in block (C) .
Delete asterisk after R23 in block (D) .
Change R39 in block (D) to 5.62 ohms.

Page 8-117, Figure 8-112, Service Sheet 38:
Change R7 to R7* and R64 to R64* in block (A) .
Change value of R7* to 1780.
Change value of R64* to 475.
Change value of R67 in block (B) to 42.2K.
Change R17 to R17* and R18 to R18* in block (C) .
Change value of R17* to 475.
Change value of R18* to 1780.
Change R27 to R27* and R28 to R28* in block (D) .
Change value of R27* to 475.
Change value of R28* to 1780.
Change R36 to R36* and R37 to R37* in block (E) .
Change value of R36* to 475.
Change value of R37* to to 1780.
Change R45 to R45* and R46 to R46* in block (F) .
Change value of R45* to 475.
Change value of R46* to 1780.
Change R48 to R48* and R49 to R49* in block (G) .
Change value of R53 (100 Hz GAIN adjustment) in block (G) to 2000.

Page 8-119, Figure 8-117, Service Sheet 39:
Change R10 in block (G) to L4 4.7 μH.
Delete L4 from "not used" in Note 7.
Add R10 under "not used" in Note 7.

Page 8-123/8-124, Figure 8-120:
Add ferrite beads, A21E1 and A21E3 to the leads to A21C17.

CHANGE 1

Page 6-66, Table 6-2:
Change A36A2C4 to 0160-4299, CAPACITOR-FXD 2200 PF +–20% 25VDC, 0429J, C067F251F222M522-CDH.

Page 6-67, Table 6-2:
Change A26A2L6 to 9100-1648, COIL-MLD 560 UH 5% Q=65 .19DX.44LG, 0127B, 19-1331-29J.

Page 8-61, Figure 8-46, Service Sheet 16:
Change A36A2C4 in block (A) to .0022 μF.
Change A36A2L6 in block (A) to 560 μH.

CHANGE 2

Page 6-17, Table 6-2:
Change A11Y1 to 0410-0490, CRYSTAL, 2.5 MHz.

Page 6-62, Table 6-2:
Change A28Q6 to 1854-0247, TRANSISTOR NPN SI TO-39 PD=1W FT=800MHz.

Page 8-69, Figure 8-54, Service Sheet 18:
Change Y1 in block (D) to 2.5 MHz.

CHANGE 3

Page 1-3, Table 1-1:
Under **Average noise level**, small table, change figures in **Avg. Noise Level (dBm)** column, top to bottom, as follows: –112, –109, –103, –94, –87, and –75.
Under **Frequency Response (with 0 or 10 dB of Input Attenuation)**, small table, change **Frequency Response (±dB MAX.)** for **Frequency Band (GHz) 3.8 to 8.5** to 2.5.

Page 1-4, Table 1-1:
In table titled "Average noise level (with 1 kHz IF bandwidth)," change figures in **Max. Avg. Noise Level (dBμV)**, top to bottom, as follows: –5, –2, +4, +13, +20, and +32.

Page 4-26, Table 4-4:
Under **Average Noise Level**, change figures for **Standard (dBm)**, top to bottom, as follows: –112, –109, –103, –94, –87, and –75.
Under **Average Noise Level**, change figures for **Option 200 (dBμV)**, top to bottom, as follows: –5, –2, +4, +13, +20, and +32.

Page 4-26, Paragraph 4-15:
Change following spectrum analyzer control settings: REF LEVEL, –60 dBm; REF LEVEL FINE, –12.

Page 4-27, Table 4-5:
Under **Average Noise Level, Maximum, Standard (dBm)**, change figures, top to bottom, as follows: –112, –109, –103, –94, –87, and –75.
Under **Average Noise Level, Maximum, Opt. 200 (dBμV)**, change figures, top to bottom, as follows: –5, –2, +4, +13, +20, and +32.

CHANGE 3 (Cont'd)

Page 4-27, Figure 4-11:
Delete Figure 4-11 and replace with following figure in this Manual Changes supplement: Figure 4-11. Average Noise Level (Sensitivity) Internal Mixing Frequency Bands (CHANGE 3).

Page 4-43, Paragraph 4-20:
Change ±2.2 dB at end of step n to ±2.5 dB.

Page 6-78, Table 6-2:
Change AT4 to 08565-60090; ATTENUATOR, COAX 3 dB.
Add AT7; 0955-0114; ATTENUATOR, COAX 3 dB.
Change W7 to 08565-20120; CABLE ASSEMBLY, 1.8 LPF OUTPUT.

Page 8-20, Figure 8-4, Service Sheet 1:
Add AT7 ATTENUATOR, 3 dB, between FL3 and K1 in RF Input Assemblies block.
Change AT4 ATTENUATOR to 3 dB.

Page 8-31, Figure 8-13, Service Sheet 6:
Change AT4 to 3 dB PAD.
Change 1.7–22 GHz input power level to A30 –18 dBm.
Change 321.4 MHz IF power level from –31 dBm to –28 dBm (two places).
Add block ◎ AT7 3 dB PAD as shown in P/O Figure 8-13 (CHANGE 3) of this Manual Changes supplement.

CHANGE 4

Page 6-15, Table 6-2:
Add A9CR7; 1901-0159; DIODE-PWR RECT 400V 750MA DO-41; 0203G; 5R1358-4.

Page 6-16, Table 6-2:
Add A9VR2; 1902-0041; DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=–.009%; 0203G; SZ 10939–98.

Page 8-97, Figure 8-93, Service Sheet 32:
Add A9VR2 and A9CR7 in block Ⓑ as shown in P/O Figure 8-93 (CHANGE 4) of this Manual Changes supplement.

CHANGE 5

Page 6-50, Table 6-2:
Change A23CR6, CR8, CR14, and CR15, to 1901-0535; DIODE-SCHOTTKY.
Change A23Q5 and Q9 to 1855-0267; TRANSISTOR J-FET N-CHAN D-MODE SI; 28480; 1855-0267.

CHANGE 5 (Cont'd)

Page 6-60, Table 6-2:
Change A27CR6, CR8, CR14, and CR15 to 1901-0535; DIODE-SCHOTTKY.
Change A27Q5 and Q9 to 1855-0267; TRANSISTOR J-FET N-CHAN D-MODE SI; 28480; 1855-0267.

CHANGE 6

Page 1-4, Table 1-1:
Change stability specification for Option 100 to read as follows:
Total residual FM (Fundamental Mixing)
Stabilized: <100 Hz P-P in 0.1 seconds
Unstabilized: <10 kHz P-P in 0.1 seconds

Page 4-18, Paragraph 4-12:
Change specification for stabilized total residual FM to read: <200 Hz P-P in 0.1 sec. .01 to 8.5 GHz (<100 Hz P-P in 0.1 sec. .01 to 4.1 GHz for Option 100).

CHANGE 7

Page 6-4, Table 6-2:
Change A1MP1 HP Part Number and Mfr Part Number to 08565-40014.
Change A1MP2 first entry HP Part Number and Mfr Part Number to 08565-00075.
Change A1MP2 second entry HP Part Number and Mfr Part Number to 08565-00078.
Change A1MP4 HP Part Number and Mfr Part Number to 08565-00082.
Change A1MP6 HP Part Number and Mfr Part Number to 08565-00077.

Page 6-5, Table 6-2:
Change A2MP1 HP Part Number and Mfr Part Number to 08565-00074.

CHANGE 8

Page 6-13, Table 6-2:
Change A7C16 to 0180-2141; CAPACITOR-FXD 3.3UF +–10% 50VDC TA; 0420J; 150D335X9050B2.
Add A7C23; 0160-3877; CAPACITOR-FXD 100PF +–20% 200VDC CER; 28480; 0160-3877.

Page 6-14, Table 6-2:
Change A7R61 to 0698-3454; RESISTOR 215K 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-2153-F.

Page 8-95, Figure 8-90, Service Sheet 31:
Change A7C16 to 3.3μF in block A.
Change A7R61 to 215K in block A.
Add A7C23, 100pF, from base to collector of A7Q10 in block A.

CHANGE 9

Page 5-75, Paragraph 5-28:
Delete entire NOTE following step q.

Page 6-67, Table 6-2:
Change A36A2R27 to A36A2R27*; 0757-0199 21.5K 1% .125W F TC=0+–100 FACTORY SELECTED PART; 0329B; C4-1/8-TO-2152-F.

Page 8-61, Figure 8-46, Service Sheet 16:
Change A36A2R27 to R27* 21.5K (fixed resistor) in block A.
Delete note 4 (right-hand side of schematic).

CHANGE 10

Page 6-53, Table 6-2:
Add A24E11; 9170-0029; CORE-SHIELDING BEAD.

Page 6-75, Table 6-2:
Change A40A2Q9 to 1854-0311; TRANSISTOR NPN 2N4240 SI TO-66 PD=35W; 0192A; 2N4240.
Change A40A2Q28 and Q29 to 1854-0079; TRANSISTOR NPN 2N3439 SI TO-5 PD=1W; 0192A; 2N3439.

Page 8-119, Figure 8-117:
Add ferrite bead (—/—) E11 to emitter of A24Q10 in block A.

CHANGE 11

Page 6-64, Table 6-2:
Change A35MP6 to 08565-00079; OSCILLATOR HOUSING–SECOND CONVERTER COVER; 28480; 08565-00079.
Change A35A1MP1 to NOT ASSIGNED.

CHANGE 12

Page 6-10, Table 6-2:
Change A4Q6 and A4Q7 to 1855-0368 (Check Digit = 7); TRANSISTOR J-FET N-CHAN D-MODE TO-72 SI; 28480; 1855-0368.

Page 6-11, Table 6-2:
Change A4R17 to 0757-0420 (Check Digit = 3); RESISTOR 750 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-751-F.

Page 6-20, Table 6-2:
Change A14C7 to 0160-0302 (Check Digit = 5); CAPACITOR-FXD .018UF +–10% 200VDC POLYE; 28480; 0160-0302.

CHANGE 12 (Cont'd)

Page 6-50, Table 6-2:
Change A23R19* and A23R43* to 0757-0290 (Check Digit = 5); RESISTOR 6.19K 1% .125W F TC=0+–100, 0299E; MF4C1/8-TO-6191-F.

Page 6-65, Table 6-2:
Change A36 HP Part Number and Mfr Part Number to 08565-60124 (Check Digit = 9).
Add A36C7; 0160-0970 (Check Digit = 3); CAPACITOR-FXD .47UF +–10% 80 VDC POLYE; 28480; 0160-0970.
Add A36MP34; 0360-0452 (Check Digit = 0); TERMINAL-SLDR LUG (GROUND CONNECTION FOR A36C7); 28480; 0360-0452.
Add A36MP35; 2190-0009 (Check Digit = 4); WASHER-LOCK INTERNAL TOOTH No. 8 .166-IN-ID; 28480; 2190-0009.

Page 6-76, Table 6-2:
Change A40A2R27 to 0757-0418 (Check Digit = 9); RESISTOR 619 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-619R-F.

Page 8-57, Figure 8-40:
Change A14C7 to .018μF in block (B).

Page 8-61, Figure 8-46:
Add A36C7 .47μF from where (958) wire connects to A36C4 (far right side of schematic) to ground.

Page 8-79, Figure 8-69:
Change A23R19* and A23R43* to 6190 ohms in blocks (D) and (G).

Page 8-93, Figure 8-88:
Change A4R17 to 750 ohms in block (D).

Page 8-109, Figure 8-103:
Change A40A2R27 to 619 ohms in block (E).

CHANGE 13

Page 6-16, Table 6-2:
Add A10R8, 0683-1055 (Check Digit = 1); RESISTOR 1M 5% .5W CC TC=0+1000; 0160G; EB1055.
Add A10V1; 1970-0050 (Check Digit = 8); TUBE-ELECTRON SURGE VOLTAGE PROTECTOR; 28480; 1970-0050.

Page 6-50, Table 6-2:
Change A23R23* and A23R48* to 0757-0441 (Check Digit = 8); RESISTOR 8.25K 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-8251-F.

CHANGE 13 (Cont'd)

Page 6-60, Table 6-2:
Change A27R23* and A27R48* to 0757-0441 (Check Digit = 8); RESISTOR 8.25K 1% .125W F TC=0+–100; 0329B; C4-1/8-TO-8251-F.

Page 8-75, Figure 8-63, Service Sheet 21:
Change A27R23* and A27R48* to 8250 ohms in blocks (E) and (H).

Page 8-79, Figure 8-69, Service Sheet 23:
Change A23R23* and A23R48* to 8250 ohms in blocks (E) and (H).

Page 8-99, Figure 8-94, Service Sheet 33:
Replace with new Figure 8-94 included in this Manual Changes supplement.

Page 8-99, Figure 8-95, Service Sheet 33:
Add A10V1 and A10R8 as shown in P/O Figure 8-95 (CHANGE 13) of this Manual Changes supplement.

CHANGE 14

Page 6-79, Table 6-2:
Change W12 HP Part Number and Mfr Part Number to 08565-20161 (Check Digit = 0).
Change W13 HP Part Number and Mfr Part Number to 08565-20162 (Check Digit = 1).

CHANGE 15

Page 6-4, Table 6-2:
Change A1MP2 first entry HP Part Number and Mfr Part Number to 08565-00085 (Check Digit = 7).
Change A1MP2 Second entry HP Part Number and Mfr Part Number to 08565-00086 (Check Digit = 8).

CHANGE 16

Page 6-4, Table 6-2:
Change A1MP4 to 08565-00112 (Check Digit = 9); PANEL, FRONT DISPLAY; 28480; 08565-00112.

Page 6-5, Table 6-2:
Change A2MP1 to 08565-00111 (Check Digit = 8); PANEL, FRONT DRESS; 28480; 08565-00111.

Page 6-78, Table 6-2:
Add AT8; 0955-0124 (Check Digit = 4); ATTENUATOR, COAX 2 DB (INCLUDED IN YTO REPLACEMENT KIT, HP PART NUMBER 08565-60161).
Change W8 to 08565-20163 (Check Digit = 2); CABLE ASSEMBLY, YTO; 28480; 08565-20163.

CHANGE 16 (Cont'd)

Page 6-79, Table 6-2:
Add 08565-60161 (Check Digit = 4); KIT, YTO REPLACEMENT (INCLUDES AT8 2 DB ATTENUATOR AND A31 YTO ASSY; DOES NOT INCLUDE W8 YTO CABLE ASSY).

Page 8-20, Figure 8-4, Service Sheet 1:
Add AT8 2 dB Attenuator between A31 YIG Tuned Oscillator and A30 First Mixer.

Page 8-23, Figure 8-5, Service Sheet 2:
Add AT8 2 dB Attenuator between A31 YTO and A30 First Mixer.

Page 8-31, Figure 8-13, Service Sheet 6:
Add block (P) AT8 2 dB Pad between A31 YTO and A30 First Mixer. Refer to block (F) for proper configuration of pad.

CHANGE 17

Page 6-8, Table 6-2:
Change A2A2DS1 through DS5 to 1990-0619 (Check Digit = 7); DISPLAY-NUM SEG 1 CHAR .3-H GA-ARSD-PPHD; 28480; 1990-0619.
Change A2A2R1 through R8 to 0698-4037 (Check Digit = 0); RESISTOR 46.4 1% .125W F TC=0±100; 0329B; C4-1/8-TO-46R4-F.

Page 6-30, Table 6-2:
Change A17U8 HP Part Number and Mfr Part Number to 1826-0618 (Check Digit = 9). The 1826-0261 may be used as an alternate replacement part.

Page 6-64, Table 6-2:
Change A35A1L2 HP Part Number and Mfr Part Number to 08559-80001 (Check Digit = 5).
Delete 9170-1028 (entire line) following A35A1L2.

Page 6-74, Table 6-2:
Change A40A2C9 to 0160-3670 (Check Digit = 6); CAPACITOR-FXD .1UF ±20% 200 VDC CER; 28480; 0160-3670.
Change A40A2CR25 to 1901-0743 (Check Digit = 1); DIODE-PWR RECT 1N4004 400V 1A DO-41; 0169H; 1N4004.

Page 6-75, Table 6-2:
Change A40A2Q30 to HP Part Number 1884-0279, Check Digit 0, THYRISTOR-SCR TO-220AB VDRM=600V MAX IT (RMS) =4A MAX PG(AV) =100 MW MAX VGT =.800V MAX RCA S2060M.

Page 8-29, Figure 8-9, Service Sheet 5:
Change A2A2R1 through R8 to 46.4 ohms.

Page 8-85, Figure 8-77, Service Sheet 26:
Delete connection between XA28 pins 34 and 35.
Connect XA28 pin 35 to bus between XA28 and XA25 and label this new line "IFG 3 (FROM J1-14)".

Page 8-107, Figure 8-102:
Delete Figure 8-102 and replace with new Figure 8-102 included in this Manual Changes supplement.

Page 8-109, Figure 103, Service Sheet 36:
Add diode CR25 in block (C) with cathode connected to TP10 (+158V) and anode connected to ground.

CHANGE 18

Page 5-49, Paragraph 5-21:
Delete step m and add following steps:

m. Set LINE switch OFF, remove extender board, install A28 Variable Gain Amplifier Assembly, set LINE switch to ON. Connect signal generator to 8565A INPUT 50Ω. Tune 8565A to 21 MHz and center signal on screen.

n. Set REF LEVEL to 0 dBm and attenuator to 0 dB. Note the signal level.

o. Set REF LEVEL to –40 dBm and attenuator to 40 dB. Adjust A24R1 40 dB to place signal at the reference level noted in step n.

p. Adjustment complete. Set LINE switch OFF, disconnect power cord, remove extender board, install A28 Variable Gain Amplifier, and install 8565A top cover.

Page 5-49, Table 5-9:
Delete Table 5-9 and replace with new Table 5-9, REF LEVEL Step Gain Adjustment (CHANGE 18) included in this Manual Changes supplement.

Table 5-9. REF LEVEL Step Gain Adjustment (CHANGE 18)

REF LEVEL	Step Attenuators	Adjustment	Voltage A21TP5
0 dBm	0 dB	A24R4 GAIN	Reference (800 mV + offset)
–10 dBm	10 dB	A24R3 10 dB	Reference ±5 mV
–20 dBm	20 dB	A24R2 20 dB	Reference ±5 mV
–30 dBm	30 dB	None	Reference ±5 mV
–40 dBm	35 dB	A24R1 40 dB	Reference ±5 mV
–50 dBm	45 dB	None	Reference ±5 mV

Page 6-8, Table 6-2:
Change A2A3 to HP Part No. 08565-60168, Check Digit 1, ASSEMBLY, TUNING.

NOTE

HP Part No. 08565-60006 is obsoleted for production, and HP Part No. 08565-60168, the preferred replacement, is not field repairable except for replacement of potentiometers A2A3R1, A2A3R2, and A2A3R3 and cable assembly A2A3W1.

Delete A2A3MP1 through A2A3MP57.

Page 6-51, Table 6-2:
Change A24 (STANDARD) to HP Part Number 08565-60166, Check Digit 9, ASSEMBLY, STEP GAIN AMPLIFIER.

CHANGE 18 (Cont'd)

Page 6-53, Table 6-2:
Change A24R1 to HP Part Number 2100-3054, Check Digit 6, RESISTOR-TRMR 50 K 10% C SIDE-ADJ 17-TRN.

Page 6-54, Table 6-2:
Change A24R38 to HP Part Number 0757-0417, Check Digit 8, RESISTOR 562 1% .125W F TC=0±100.

Page 6-59, Table 6-2:
Change A27CR2 to HP Part Number 1901-0639, Check Digit 4, DIODE-PIN 110V.

Page 6-61, Table 6-2:
Change A28 to HP Part Number 08565-60121, Check Digit 6, ASSEMBLY, VARIABLE GAIN.

Page 6-62, Table 6-2:
Add A28C38 through A28C43, HP Part Number 0160-2055, Check Digit 9, CAPACITOR-FXD .01UF +80 −20% 100 VDC CER.
Add A28CR13, HP Part Number 1901-0047, Check Digit 8, DIODE-SWITCHING 20V 75MA 10NS.
Add A28E5, HP Part Number 9170-0029, Check Digit 3, CORE-SHIELDING BEAD.
Change A28L4 to HP Part Number 9140-0112, Check Digit 2, COIL-MLD 4.7UH 10% Q=33 .155DX.375LG-NOM.
Add A28L10 and A28L11, HP Part Number 9100-1623, Check Digit 8, COIL-MLD 27UH 5% Q=60 .155DX.375LG-NOM.
Add A28Q8 and A28Q9, HP Part Number 1854-0247, Check Digit 9, TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ.

Page 6-63, Table 6-2:
Add A28R38, HP Part Number 07575-0274, Check Digit 5, RESISTOR 1.21K 1% .125W F TC=0±100.
Add A28R39, HP Part Number 0698-0083, Check Digit 8, RESISTOR 1.96K 1% .125W F TC=0±100.
Add A28R40, HP Part Number 0757-0416, Check Digit 7, RESISTOR 511 1% .125W F TC=0±100.
Add A28R41, HP Part Number 0757-0401, Check Digit 0, RESISTOR 100 1% .125W F TC=0±100.
Add A28R42, HP Part Number 0698-3447, Check Digit 4, RESISTOR 422 1% .125W F TC=0±100.
Add A28R43, HP Part Number 0757-0346, Check Digit 2, RESISTOR 10 1% .125W F TC=0±100.
Add A28R44, HP Part Number 0698-3447, Check Digit 4, RESISTOR 422 1% .125W F TC=0±100.
Add A28R45, HP Part Number 0757-0280, Check Digit 3, RESISTOR 1K 1% .125W F TC=0±100.
Add A28R46, HP Part Number 0757-0417, Check Digit 8, RESISTOR 562 1% .125W F TC=0±100.
Add A28R47, HP Part Number 0757-0280, Check Digit 3, RESISTOR 1K 1% .125W F TC=0±100.
Add A28R48, HP Part Number 0757-0442, Check Digit 9, RESISTOR 10K 1% .125W F TC=0±100.
Add A28R49, HP Part Number 0698-3447, Check Digit 4, RESISTOR 422 1% .125W F TC=0±100.
Add A28VR2, HP Part Number 1902-0048, Check Digit 1, DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%.

Page 8-72, Service Sheet 20:
In A28 VARIABLE GAIN ASSEMBLY, CIRCUIT DESCRIPTION:
Change **Band Conversion Loss Compensating Amplifier (D)** to **Band Conversion Loss Compensating Amplifier (E)**.
Change **Reference Level Calibration Attenuator (E)** to **Reference Level Calibration Attenuator (F)**.
Change **Signal Identifier Attenuator (F)** to **Signal Identifier Attenuator (G)**
Add the following paragraphs:

5 dB Step Gain Amplifier (D)

The buffer amplifier Q8 operates as an emitter-follower and provides isolation between the IF pre-amplifier circuit and Q9.

Transistor Q9 functions as either a unity gain amplifier or as a 5 dB gain amplifier switch in conjunction with the 15 dB Step Gain Amplifier circuit of A24 Step Gain Amplifier Assembly.

The gain of the Q9 stage is set by the ratio R42/R44. When the 15 dB Step Gain circuit of A24 is selected (IFG3 line grounded), R46 is switched in parallel to R44, resulting in a gain of 5 dB for Q9.

CHANGE 18 (Cont'd)

Page 8-73, Figure 8-58:
Delete Figure 8-58 and replace with the following figure in this Manual Changes supplement: Figure 8-58. A28 Variable Gain Assembly, Component Locations (CHANGE 18).

Page 8-73, Figure 8-59:
Delete Figure 8-59 and replace with the following figure in this Manual Changes supplement: Figure 8-59. A28 Variable Gain Assembly, Schematic Diagram (CHANGE 18).

Page 8-76, Service Sheet 22:
In A24 STEP GAIN AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION:
Delete circuit description for **10 dB Amplifier, First 20 dB Amplifier, and Second 20 dB Amplifier** B C D .
Add new circuit description in the following paragraphs:

10 dB Amplifier, 20 dB Amplifier, and 15 dB Amplifier B C D

The three step gain amplifiers (10 dB Amplifier, 20 dB Amplifier, and 15 dB Amplifier) can be considered as operational amplifiers. An equivalent circuit for the three stages is shown in Figure 8-65. The gain for each amplifier is $Av = 1 + R_f/R_i$. The feedback resistance R_f is R26, 562 ohms, for the 10 dB Amplifier; R32, 750 ohms, for the 20 dB Amplifier; and R38, 562 ohms, for the 15 dB Amplifier. The input resistance R_i is a combination of a fixed series resistance (56.2 ohms) and the controlled resistance of the PIN diodes. The resistance of the PIN diodes is approximately 10 to 1000 ohms and increases as the forward bias current is decreased from 10 mA to 10 μA. R_i is approximately 260 ohms for the 10 dB Amplifier and 83 ohms for the 20 dB Amplifier and the 15 dB Amplifier. Selection of the correct combination of step gain amplifiers is effected by the front-panel REF LEVEL dBm control. Rotating the switch grounds the emitter circuit of the selected amplifer(s), allowing current to flow through the PIN diode(s). The possible switch combinations allow the gain to vary from unity (all switches open) to 50 dB maximum gain with all three emitter circuits grounded. In addition, 5 dB of step gain from A28 Variable Gain Assembly is switched in simultaneously with that of the 15 dB Amplifier to provide 20 dB of step gain.

A TEST/NORM switch S1 is included in the emitter paths of the 15 dB and 20 dB step gain amplifiers. The switch provides a fixed 10 dB of gain for use when making LOG amplifier adjustments.

Page 8-77, Figure 8-67:
Change HP Part Number of A24 Step Gain Amplifier to 08565-60166.
Change title of function block C to "20 dB Amplifier."
Change title of function block D to "15 dB Amplifier."
Change resistance of R38 to 562 ohms.
Change resistance of R1 to 50K.

Page 8-118, Service Sheet 39:
In A24 STEP GAIN AMPLIFIER/OSCILLATOR ASSEMBLY (OPTION 100), CIRCUIT DESCRIPTION, under **Step Gain Amplifiers** B C D :

Change "20 dB Amplifier" to "15 dB Amplifier" throughout.
Change value of R38 to 562 ohms throughout.
In last sentence of first paragraph, change "33 dB" to "28 dB."

CHANGE 18 (Cont'd)

Page 8-118, Figure 8-113:
Change "20 dB Amplifier" to "15 dB Amplifier."
Change value of R38 to 562 ohms.

Page 8-119, Figure 8-117:
Change title of function block (D) to "15 dB Amplifier."
Change value of R1 to 50K.
Change value of R38 to 562 ohms.

CHANGE 19

Page 6-78, Table 6-2:
Change description of U1 to "TRIPLER, HV 10KV (RECOMMENDED REPLACEMENT)."
Add second entry for U1: U1, HP Part No. 0960-0432, TRIPLER HV 10KV (ALTERNATE).

CHANGE 20

Page 6-4, Table 6-2:
Change A1MP3 to HP Part No. 08565-00087, Check Digit 7, PANEL, FRONT LEFT DISPLAY.

CHANGE 21

Page 5-52, Paragraph 5-22:
Change step d as follows:
d. Connect digital voltmeter to A16TP6 INT SWP and use A16TP4 for ground return. Adjust A16R131 −5V for a voltage at A16TP6 of −5.00 ± 0.02 V.

Page 6-26, Table 6-2:
Change A16R59 to HP Part Number 0757-0288, Check Digit 1, RESISTOR 9.09K 1% .125W F TC=0±100.
Add A16R131, HP Part Number 2100-3109, Check Digit 2, RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN.

Page 6-71, Table 6-1:
Change A39 to HP Part No. 08565-60167, Check Digit 0, ASSEMBLY, READOUT DRIVER.

Page 6-72, Table 6-2:
Add A39R62, HP Part No. 0698-3334, Check Digit 8, RESISTOR 178 1% .5W F TC=0±100.
Change A39U6 to HP Part No. 1818-0978, Check Digit 7, EPROM.

Page 6-73, Table 6-2:
Add A39VR2, HP Part No. 1902-0041, DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=−.009%.

CHANGE 21 (Cont'd)

Page 8-38, Service Sheet 10:
In A16 SWEEP GENERATOR ASSEMBLY, CIRCUIT DESCRIPTION, under **Sweep Generator** (D), add the following sentence immediately preceding **Single Sweep Control**:
A16R131 –5V sets the –5-volt point of the sweep ramp.

Page 8-38, Figure 8-23:
Change value of R59 to 2K.
Add potentiometer R131 –5V between R59 and the junction labeled "–5V to +5V RAMP OUT."

Page 8-39, Figure 8-24:
Add potentiometer R131 –5V between R59 and junction labeled "RAMP OUTPUT."

Page 8-40, Figure 8-26:
Delete Figure 8-26 and replace with new Figure 8-26 included in this Manual Changes supplement.

Page 8-41, Figure 8-27:
Delete function block titled "SWEEP GENERATOR (D)" and replace with new function block (D) included with this Manual Changes supplement as P/O Figure 8-27.

Page 8-104, Figure 8-98:
Delete Figure 8-98 and replace with new Figure 8-98 included in this Manual Changes supplement.

Page 8-105, Figure 8-99:
Delete function block titled "SWITCH CODE TO 7 SEGMENT DISPLAY DECODER (J)" and replace with new function block (J) included in this Manual Changes supplement as P/O Figure 8-99.

CHANGE 22

Page 6-16, Table 6-2:
Change A10 ASSEMBLY, DISPLAY MOTHERBOARD HP Part Number to 08565-60169, Check Digit 2.

Page 6-66, Table 6-2:
Change A36A2C10 to HP Part Number 0160-2204, Check Digit 0, CAPACITOR-FXD 100 PF +–5% 300 VDC MICA.

Page 6-67, Table 6-2:
Change A36A2R21 to HP Part Number 0757-0444, Check Digit 1, RESISTOR 12.1K 1% .125W F TC=0+–100.
Change A36A2U1 to HP Part Number 1826-0229, Check Digit 9, IC OP AMP LOW-DRIFT TO-99.

Page 8-61, Figure 8-46:
Change value of A36A2C10 to 100 pF.
Change value of A36A2R21 to 12.1K.

Page 6-80, Table 6-2:
Change SHIELD, HIGH VOLTAGE to HP Part Number 08565-00114, Check Digit 1.

CHANGE 23

Page 6-48, Table 6-2:

Change A23 to HP Part Number 08565-60174, Check Digit 9, ASSEMBLY, BANDWIDTH FILTER NO. 2.

NOTE

HP Part Number 08565-60174 is the preferred replacement for both 08565-60033 and 08565-60034. If replacement is necessary for either board, both boards must be replaced at the same time.

Change A23C3 to NOT ASSIGNED.

Change A23C5 to HP Part Number 0160-2055, Check Digit 9, CAPACITOR-FXD .01UF +80–20% 100VDC CER.

Page 6-49, Table 6-2:

Change A23C14 to HP Part Number 0160-2250, Check Digit 6, CAPACITOR-FXD 5.1PF +–.25PF 500VDC CER.

Change A23C16* and A23C20* to HP Part Number 0140-0199, Check Digit 6, CAPACITOR-FXD 240PF +–5% 300VDC MICA.

Change A23C21 to HP Part Number 0160-0437, Check Digit 7, CAPACITOR-FXD 12PF +–5% 500VDC CER.

Change A23C24 to HP Part Number 0160-2055, Check Digit 9, CAPACITOR-FXD .01UF +80–20% 100VDC CER.

Change A23C31 to HP Part Number 0160-4298, Check Digit 6, CAPACITOR-FXD 4700PF +–20% 100VDC CER.

Change A23C32 to HP Part Number 0160-4084, Check Digit 8, CAPACITOR-FXD .1UF +–20% 50VDC CER.

Change A23C37 to HP Part Number 0160-2250, Check Digit 6, CAPACITOR-FXD 5.1PF +–.25PF 500VDC CER.

Change A23C39 to NOT ASSIGNED.

Change A23C43* and A23C64* to HP Part Number 0160-3046, Check Digit 0, CAPACITOR-FXD 250PF +–1% 100VDC MICA.

Change A23C44 to HP Part Number 0160-0437, Check Digit 7, CAPACITOR-FXD 12PF +–5% 500VDC CER.

Add A23C68, HP Part Number 0160-2258, Check Digit 4, CAPACITOR-FXD 11PF +–5% 500VDC CER 0+–30.

Add A23C69, HP Part Number 0160-2055, Check Digit 9, CAPACITOR-FXD .01UF +80–20% 100VDC CER.

Page 6-50, Table 6-2:

Change A23CR18 to NOT ASSIGNED.

Change A23E1 to NOT ASSIGNED.

Add A23E9 and A23E10, HP Part Number 9170-0029, Check Digit 3, CORE-SHIELDING BEAD.

Change A23L7 and A23L13 to HP Part Number 9140-0098, Check Digit 3, INDUCTOR RF-CH-MLD 2.2UH 10%.

Change A23L9 to HP Part Number 9100-1619, Check Digit 2, INDUCTOR RF-CH-MLD 6.8UH 10%.

Add A23L18, HP Part Number 9100-1619, Check Digit 2, INDUCTOR RF-CH-MLD 6.8UH 10%.

Add A23L19, HP Part Number 9140-0144, Check Digit 0, INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG.

Change A23R1 to HP Part Number 0757-0444, Check Digit 1, RESISTOR 12.1K 1% .125W F TC=0+–100.

Change A23R2 to HP Part Number 0698-3156, Check Digit 2, RESISTOR 14.7K 1% .125W F TC=0+–100.

Change A23R3* to HP Part Number 0757-0403, Check Digit 2, RESISTOR 121 1% .125W F TC=0+–100.

Add A23R4, HP Part Number 0757-0442, Check Digit 9, RESISTOR 10K 1% .125W F TC=0+–100.

Change A23R7* to HP Part Number 0698-8821, Check Digit 8, RESISTOR 5.62 1% .125W F TC=0+–100.

Change A23R8 to HP Part Number 0757-0401, Check Digit 0, RESISTOR 100 1% .125W F TC=0+–100.

Change A23R9 to HP Part Number 0757-0439, Check Digit 4, RESISTOR 6.81K 1% .125W F TC=0+–100.

Change A23R10 to HP Part Number 0757-1094, Check Digit 9, RESISTOR 1.47K 1% .125W F TC=0+–100.

Change A23R11 to HP Part Number 0757-0440, Check Digit 7, RESISTOR 7.5K 1% .125W F TC=0+–100.

Change A23R12 to HP Part Number 0757-0447, Check Digit 4, RESISTOR 16.2K 1% .125W F TC=0+–100.

Change A23R13 to HP Part Number 0698-0082, Check Digit 7, RESISTOR 464 1% .125W F TC=0+–100.

Change A23R15 to HP Part Number 0698-3440, Check Digit 7, RESISTOR 196 1% .125W F TC=0+–100.

Change A23R16 to HP Part Number 0757-0419, Check Digit 0, RESISTOR 681 1% .125W F TC=0+–100.

CHANGE 23 (Cont'd)

Page 6-50, Table 6-2 (Cont'd):

Change A23R18 to HP Part Number 0698-3154, Check Digit 0, RESISTOR 4.22K 1% .125W F TC=0+–100.
Change A23R19* to HP Part Number 0698-3154, Check Digit 0, RESISTOR 4.22K 1% .125W F TC=0+–100.
Change A23R20 and A23R21 to HP Part Number 0757-0442, Check Digit 9, RESISTOR 10K 1% .125W F TC=0+–100.
Change A23R23* to HP Part Number 0757-0441, Check Digit 8, RESISTOR 8.25K 1% .125W F TC=0+–100.
Change A23R24* to HP Part Number 0698-8827, Check Digit 4, RESISTOR 1M 1% .125W F TC=0+–100.

Page 6-51, Table 6-2:

Change A23R26 to HP Part Number 2100-3163, Check Digit 8, RESISTOR-TRMR 1M 20% C SIDE-ADJ 17-TRN.
Change A23R27 and R49 to HP Part Number 0757-0444, Check Digit 1, RESISTOR 12.1K 1% .125W F TC=0+–100.
Change A23R28 and A23R52 to HP Part Number 0757-0443, Check Digit 0, RESISTOR 11K 1% .125W F TC=0+–100.
Change A23R29 and A23R36 to HP Part Number 0698-0083, Check Digit 8, RESISTOR 1.96K 1% .125W F TC=0+–100.
Change A23R30 to HP Part Number 0757-0402, Check Digit 1, RESISTOR 110 1% .125W F TC=0+–100.
Add A23R32*, HP Part Number 0757-0465, Check Digit 6, RESISTOR 100K 1% .125W F TC=0+–100.
Change A23R33, A23R42, and A23R55 to HP Part Number 0757-0442, Check Digit 9, RESISTOR 10K 1% .125W F TC=0+–100.
Change A23R34 to HP Part Number 0757-0199, Check Digit 3, RESISTOR 21.5K 1% .125W F TC=0+–100.
Change A23R35 to HP Part Number 0757-0288, Check Digit 1, RESISTOR 9.09K 1% .125W F TC=0+–100.
Change A23R37 and A23R54 to HP Part Number 0757-0416, Check Digit 7, RESISTOR 511 1% .125W F TC=0+–100.
Change A23R38 to HP Part Number 0698-3441, Check Digit 8, RESISTOR 215 1% .125W F TC=0+–100.
Change A23R39 to HP Part Number 0757-0419, Check Digit 0, RESISTOR 4.22K 1% .125W F TC=0+–100.
Change A23R41 to HP Part Number 0698-3154, Check Digit 0, RESISTOR 681 1% .125W F TC=0+–100.
Change A23R43* to HP Part Number 0698-3155, Check Digit 1, RESISTOR 4.64K 1% .125W F TC=0+–100.
Change A23R48* to HP Part Number 0757-0441, Check Digit 8, RESISTOR 8.25K 1% .125W F TC=0+–100.
Change A23R50 to HP Part Number 0757-0346, Check Digit 2, RESISTOR 10 1% .125W F TC=0+–100.
Change A23R56* to HP Part Number 0757-0422, Check Digit 5, RESISTOR 909 1% .125W F TC=0+–100.
Change A23R58 to HP Part Number 0698-3152, Check Digit 8, RESISTOR 3.48K 1% .125W F TC=0+–100.
Change A23R60 to 0698-3153, Check Digit 9, RESISTOR 3.83K 1% .125W F TC=0+–100.

Page 6-59, Table 6-2:

Change A27 to HP Part Number 08565-60174, Check Digit 9, ASSEMBLY, BANDWIDTH FILTER NO. 2.
Delete entire listing of replaceable parts for A27. Use parts list for A23, but use A27 prefix.

Page 8-75, Figure 8-62:

Delete Figure 8-62 and replace with Figures 8-62 and 8-68 (CHANGE 23) in this Manual Changes supplement.

Page 8-75, Figure 8-63:

Delete Figure 8-63 and replace with Figure 8-63 (CHANGE 23) in this Manual Changes supplement.

Page 8-79, Figure 8-68:

Delete Figure 8-68 and replace with Figures 8-62 and 8-68 (CHANGE 23) in this Manual Changes supplement.

Page 8-79, Figure 8-69:

Delete Figure 8-69 and replace with Figure 8-69 (CHANGE 23) in this Manual Changes supplement.

CHANGE 24

Page 6-63, Table 6-2:
Delete A29C13 and change description to NOT ASSIGNED.
Delete A29R9 and change description to NOT ASSIGNED.
Add A29W1, HP Part Number 8159-0005, Check Digit 0, WIRE 22AWG W PVC 1X22 80C.

Page 8-84, Figure 8-76:
Delete C13 and R9. Show jumper wire W1 in place of R9.

Page 8-85, Figure 8-77 (2 of 2):
At 3RD CONV, delete C13 and R9. Show jumper wire A29W1 in place of R9.

CHANGE 25

Page 6-23, Table 6-2:
Add A15CR19, HP Part Number 1901-0050, DIODE-SWITCHING 80V 200MA 2NS DO-35.

Page 8-42, Figure 8-28:
Add CR19 to left of R57.

Page 8-43, Figure 8-29:
In block (E), add CR19 in series with R57 (cathode common with R57) in base circuit of Q15. Add NOTE 9: The base and collector of Q15 are surrounded by a guard ring trace to make this part of the circuit less susceptible to leakage current.

CHANGE 26

Page 6-50, Table 6-2:
Change A23L6 and A23L15 to HP Part Number 9140-0434, Check Digit 1, INDUCTOR 385 NH 15% .354DX.906LG Q=150.

Page 6-60, Table 6-2:
Change A27L6 and A27L15 to HP Part Number 9140-0434, Check Digit 1, INDUCTOR 385NH 15% .354DX.906LG Q=150.

Page 6-78, Table 6-2:
Change FL1 to HP Part Number 9135-0131, Check Digit 4, FILTER, 2.06 GHz.

Page 8-33, Figure 8-15:
Change title of block (A) to "FL2 2060 MHz Low Pass Filter."

Page 8-75, Figure 8-63:
In function block (C), change value of L6 to 0.385.
In function block (F), change value of L15 to 0.385.

Page 8-79, Figure 8-79:
In function block (C), change value of L6 to 0.385.
In function block (F), change value of L15 to 0.385.

CHANGE 27

NOTE

The effect of CHANGE 27 is to delete CHANGE 24.

Page 6-65, Table 6-2:

Change A29C13 to HP Part Number 0180-0228, Check Digit 6, CAPACITOR-FXD 22UF +–10% 15VDC TA.
Change A29R9 to HP Part Number 0757-0346, Check Digit 2, RESISTOR 10 1% .125W F TC=0+–100.
Change description of A29W1 to "NOT ASSIGNED."

CHANGE 28

Page 5-26, Paragraph 5-16:

Change the fourth sentence under DESCRIPTION to read: "WRITE DEPTH is set so the CRT screen turns dark green after the display is erased with the WRITE SPEED control fully counterclockwise."

Page 5-29, Paragraph 5-16:

Change step j to read: "Set front panel INTENSITY control fully counterclockwise and front panel PERSIST and WRITE SPEED controls fully clockwise."
Change second sentence of step l to read: "Then adjust A7R17 WRITE DEPTH for a half dark and half bright green display after pressing and releasing the ERASE button."

Page 6-4, Table 6-2:

Change A1MP1 to HP Part Number 08565-40016, Check Digit 6, SUB-PANEL, FRONT DISPLAY.
Change A1MP2, first entry, to HP Part Number 08565-00134, Check Digit 5, PANEL, FRONT LEFT LOWER (STANDARD).
Change A1MP2, second entry, to HP Part Number 08565-00135, Check Digit 6, PANEL, FRONT LEFT LOWER (OPT 002).
Change A1MP3 to HP Part Number 08565-00121, Check Digit 0, PANEL, FRONT LEFT DISPLAY.
Change A1MP4 to HP Part Number 08565-00138, Check Digit 9, PANEL, FRONT DISPLAY.

Page 6-5, Table 6-2:

Change A2MP1 to HP Part Number 08565-00137, Check Digit 8, PANEL, FRONT DRESS.
Change A2MP2 to HP Part Number 08565-00133, Check Digit 4, PANEL, SUB-FRONT.

Page 6-9, Table 6-2:

Change A2A3W1 to HP Part Number 08565-60176, Check Digit 1, CABLE ASSEMBLY, TUNING.
Add A2A3A1, HP Part Number 08565-60175, Check Digit 0, ASSEMBLY, INTERCONNECT BOARD.

Page 6-10, Table 6-2:

Change A3 to HP Part Number 08565-60177, Check Digit 2, ASSEMBLY, DISPLAY ADJUST.
Add A3R5, HP Part Number 2100-3898, Check Digit 6, RESISTOR-VAR CONTROL CP 1K 10% LIN.

Page 6-12, Table 6-2:

Change A7 to HP Part Number 08565-60178, Check Digit 3, ASSEMBLY, STORAGE.

Page 6-13, Table 6-2:

Change A7A17 to HP Part Number 2100-3207, Check Digit 1, RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN.

CHANGE 28 (Cont'd)

Page 6-78, Table 6-2:
Change W2 to HP Part Number 08565-20182, Check Digit 5, CABLE ASSEMBLY, RF ATTEN.
Change W3 to HP Part Number 08565-20183, Check Digit 6, CABLE ASSEMBLY, YTF INPUT.
Change W6 to HP Part Number 08565-20184, Check Digit 7, CABLE ASSEMBLY, 1.8 LPF INPUT.

Page 6-80, Table 6-2:
Delete HP Part Number 08565-00012.
Add HP Part Number 08565-00017, Check Digit 4, BRACKET, ATTEN MOUNT.
Add HP Part Number 08565-00018, Check Digit 5, BRACKET, RF SWITCH MOUNT.
Change listing for HP Part Number 1490-0841, COUPLER, SHAFT, to show Check Digit 7 and quantity of 5.
Delete HP Part Number 08565-20064, Qty 4, DISPLAY SHAFT.
Add HP Part Number 08565-20179, Check Digit 0, Qty 2, DISPLAY SHAFT.
Add HP Part Number 08565-20180, Check Digit 3, Qty 3, DISPLAY SHAFT.

Page 8-86, Figure 8-81:
Replace with new component location diagram provided in this Manual Changes supplement as Figure 8-81. A3 Display Adjust Assembly, Component Locations (CHANGE 28).

Page 8-87, Figure 8-82:
Change A3 schematic as shown in partial schematic provided in this Manual Changes supplement as P/O Figure 8-82.

Page 8-95, Figure 8-90:
In pin connection table, change A7P1-7 to WRITE SPEED, A3P1-9, (H) .
Change function block (H) as shown in partial schematic provided in this Manual Changes supplement as P/O Figure 8-90.

CHANGE 29

►Page 5-32, Paragraph 5-18:
Replace paragraph 5-18 with new LOG AMPLIFIER ADJUSTMENT (CHANGE 29) procedure included in this Manual Changes supplement.

Page 6-18, Table 6-2:
Add A12C23*, HP Part Number 0160-4498, Check Digit 8, CAPACITOR-FXD 5.6PF +–.5PF 200 VDC CER.

Page 6-19, Table 6-2:
Change A12R51 to A12R52*.
Change A12R53 to HP Part Number 2100-3273, Check Digit 1, RESISTOR0TRMR 2K 10% C SIDE-ADJ 1-TRN.

►Page 6-45, Table 6-2:
Replace entire A22 Replaceable Parts list (A22 through A22VR3) with new A22 Replaceable Parts (CHANGE 29) list included in this Manual Changes supplement.

CHANGE 29 (Cont'd)

Page 8-65, Figure 8-51, Service Sheet 17:
In block F, add C23*, 5.6 pF, between E2 and U6B pin 5.
Add asterisk to R52 in block J.
Change value of R53 to 2K.
Delete measurement point C and add TP4 at U8 pin 2 in block D.
Delete measurement point J and add TP5 at E7 in block E.

Page 6-67, Table 6-2:
Change A37 to HP Part Number 08565-60192, Check Digit 1, ASSEMBLY, THIRD CONVERTER.

Page 6-68, Table 6-2:
Change A37MP1 to HP Part Number 08565-20192, Check Digit 7, HOUSING, THIRD CONVERTER.
Change A37MP3 to HP Part Number 08565-00122, Check Digit 1, COVER, THIRD CONVERTER.

Page 6-69, Table 6-2:
Change A37A3 to HP Part Number 08565-60186, Check Digit 3, ASSEMBLY, THIRD CONVERTER OSCILLATOR.

Page 6-70, Table 6-2:
Change A37A3R27 to HP Part Number 2100-1799, Check Digit 2, RESISTOR-TRMR 500 10% WW SIDE-ADJ 20-TRN.

Page 6-79, Table 6-2:
Change W21 to HP Part Number 08565-60180, Check Digit 7, CABLE ASSEMBLY, 321.4 IF (YELLOW).

Page 6-80, Table 6-2:
Change part number of BRACKET, TUNE STABILIZER, FRONT, to 08565-00123, Check Digit 2.

Page 8-35, Figure 8-18:
Delete loading diagram for A37A3 and replace with new loading diagram provided in this Manual Changes supplement as P/O Figure 8-18 (CHANGE 29).

Page 8-35, Figure 8-19:
Change HP Part Number of A37 THIRD CONVERTER ASSY to 08565-60192.
Change HP Part Number of A37A3 THIRD CONVERTER OSCILLATOR to 08565-60186.

►Page 8-80, Figure 8-71:
Replace Figure 8-71, A22 Log Amplifier Assembly Component Locations, with new Figure 8-71 (CHANGE 29) included in this Manual Changes supplement. (NOTE: Figure number and caption were inadvertently deleted in original illustration.)

►Page 8-81, Figure 8-72:
Replace Figure 8-72, A22 Log Amplifier Assembly Schematic, with new Figure 8-72 (CHANGE 29), Sheets 1 of 2 and 2 of 2, included in this Manual Changes supplement.

►CHANGE 30

Page 6-19, Table 6-2:
Delete A13CR3.

Page 6-20, Table 6-2:
Delete A13R13.

Page 8-37, Figure 8-20:
Delete CR3 and R3.

Page 8-37, Figure 8-21:
Delete CR3 and R3. (There is no longer a connection between P1-11 and the Signal Identifier circuitry.)

►CHANGE 31

Page 6-54, Table 6-2:
Change A25 to HP and Mfr Part Number 08565-60195, Check Digit 4.

Page 6-56, Table 6-2:
Add A25S1, HP Part Number 3101-1274, Check Digit 1, Qty 1, SWITCH-SL SPDT SUBMIN 2A 120VAC PC, 28480, 3101-1274.

Page 8-113, Figure 8-108:
Replace Figure 8-108, A25 Up-Down Converter Assembly (Option 100), Component Locations, with new Figure 8-108 (CHANGE 31) included in this Manual Changes supplement.

Page 8-115, Figure 8-109:
Replace Figure 8-109, A25 Up-Down Converter Assembly (Option 100) Schematic Diagram, with new Figure 8-109 (CHANGE 31) included in this Manual Changes supplement.

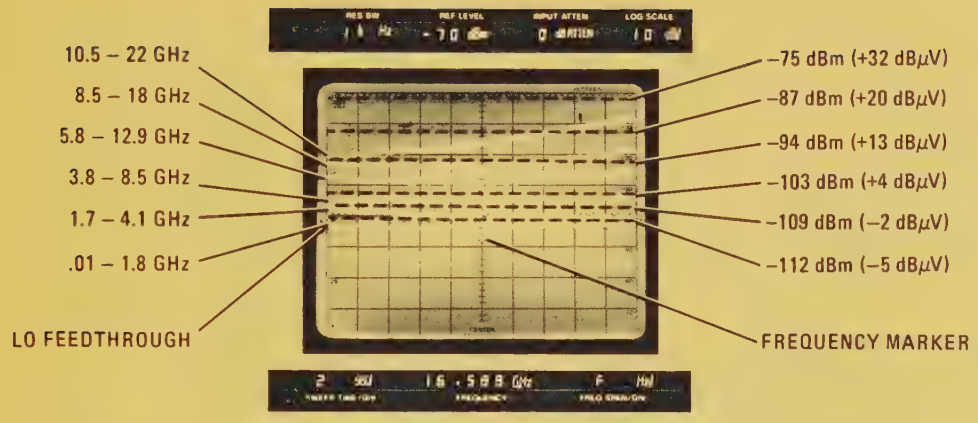
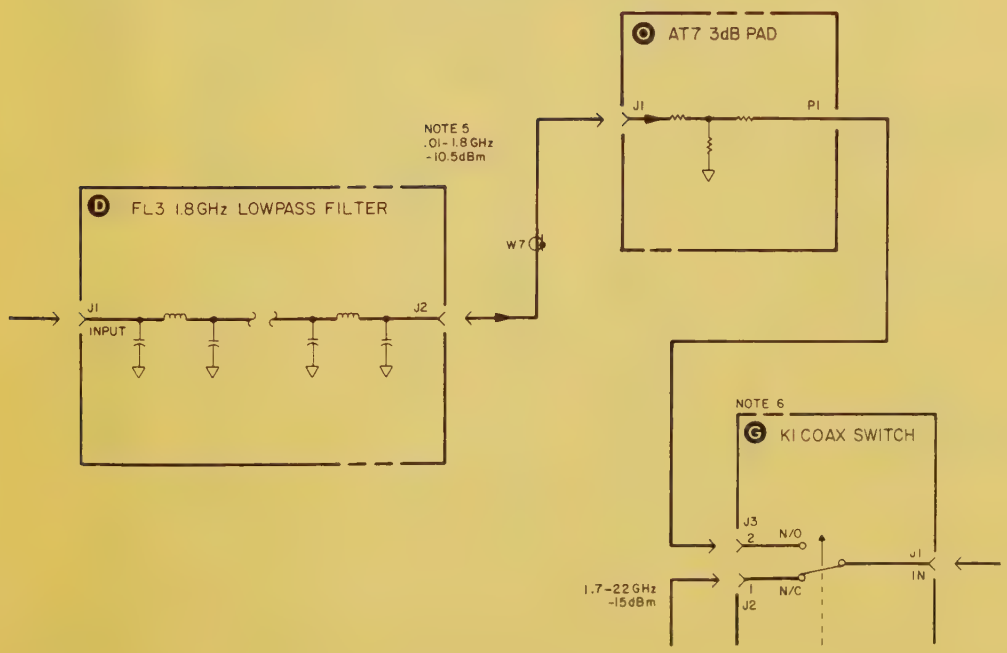


Figure 4-11. Average Noise Level (Sensitivity) Internal Mixing Frequency Bands (CHANGE 3)



P/O Figure 8-13 (CHANGE 3)

A37A3

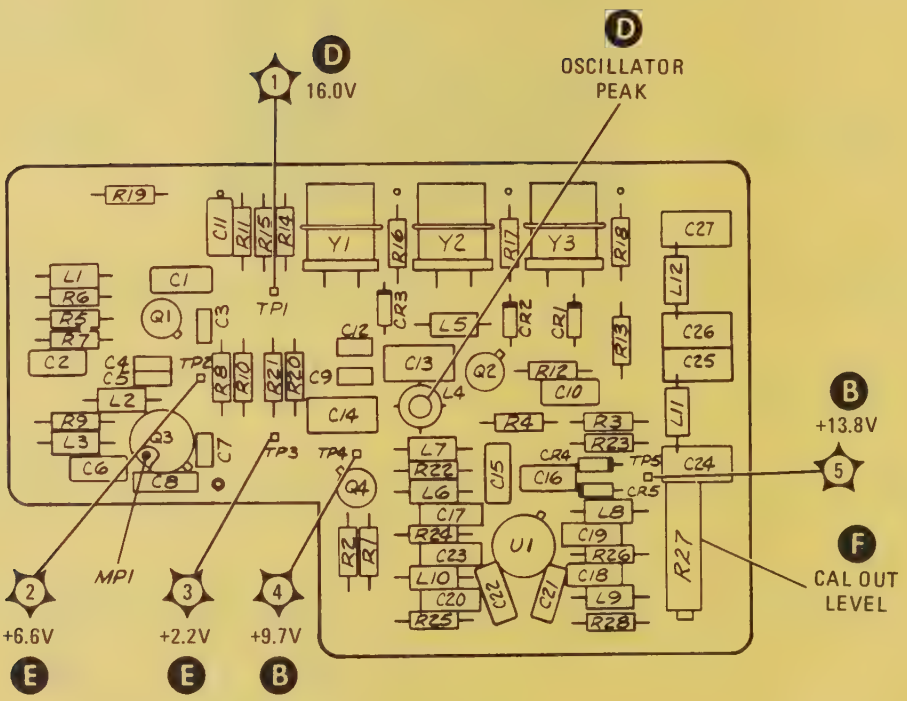


Figure 8-18. A37 Third Converter Assembly, Component Locations

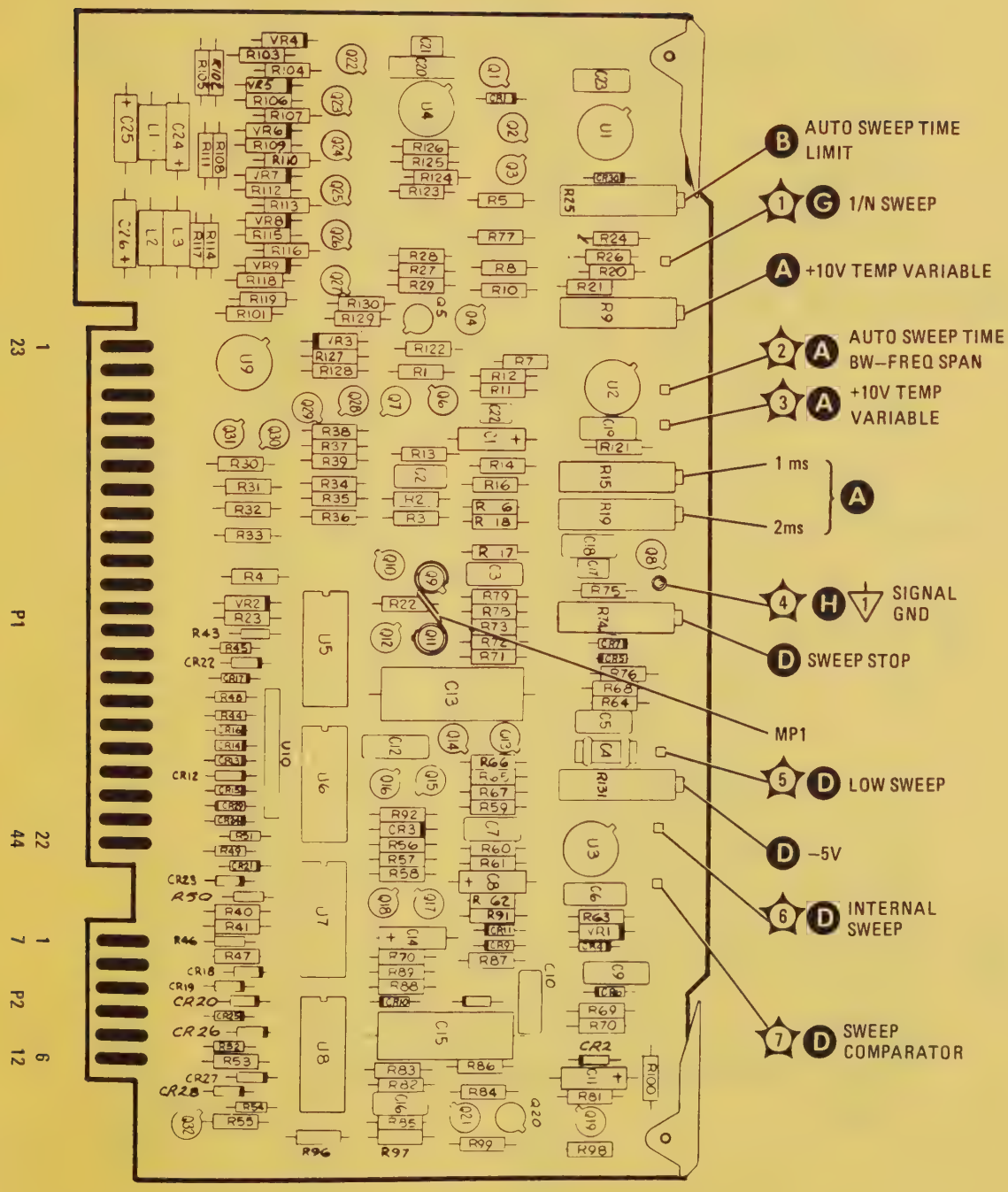
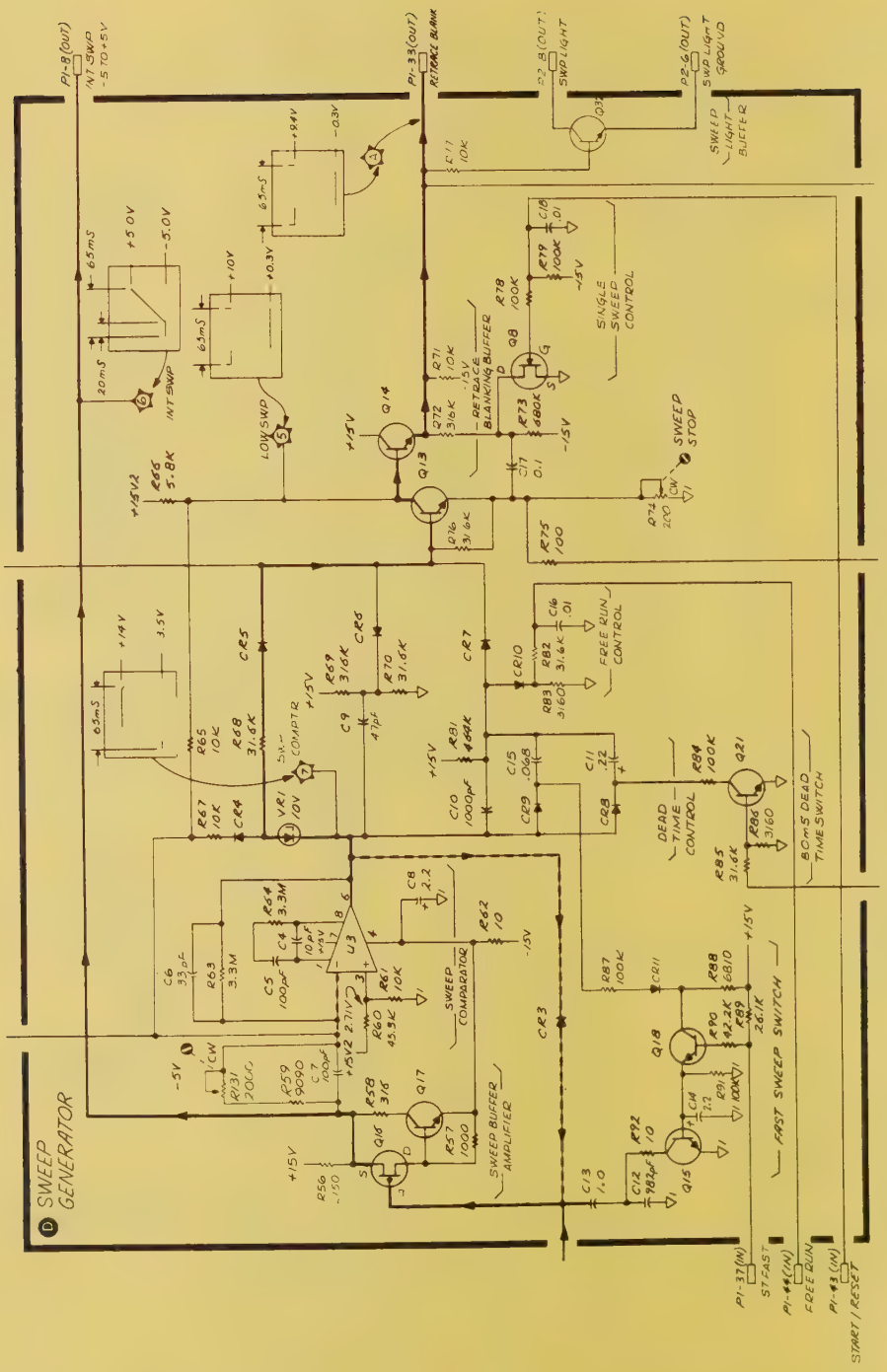
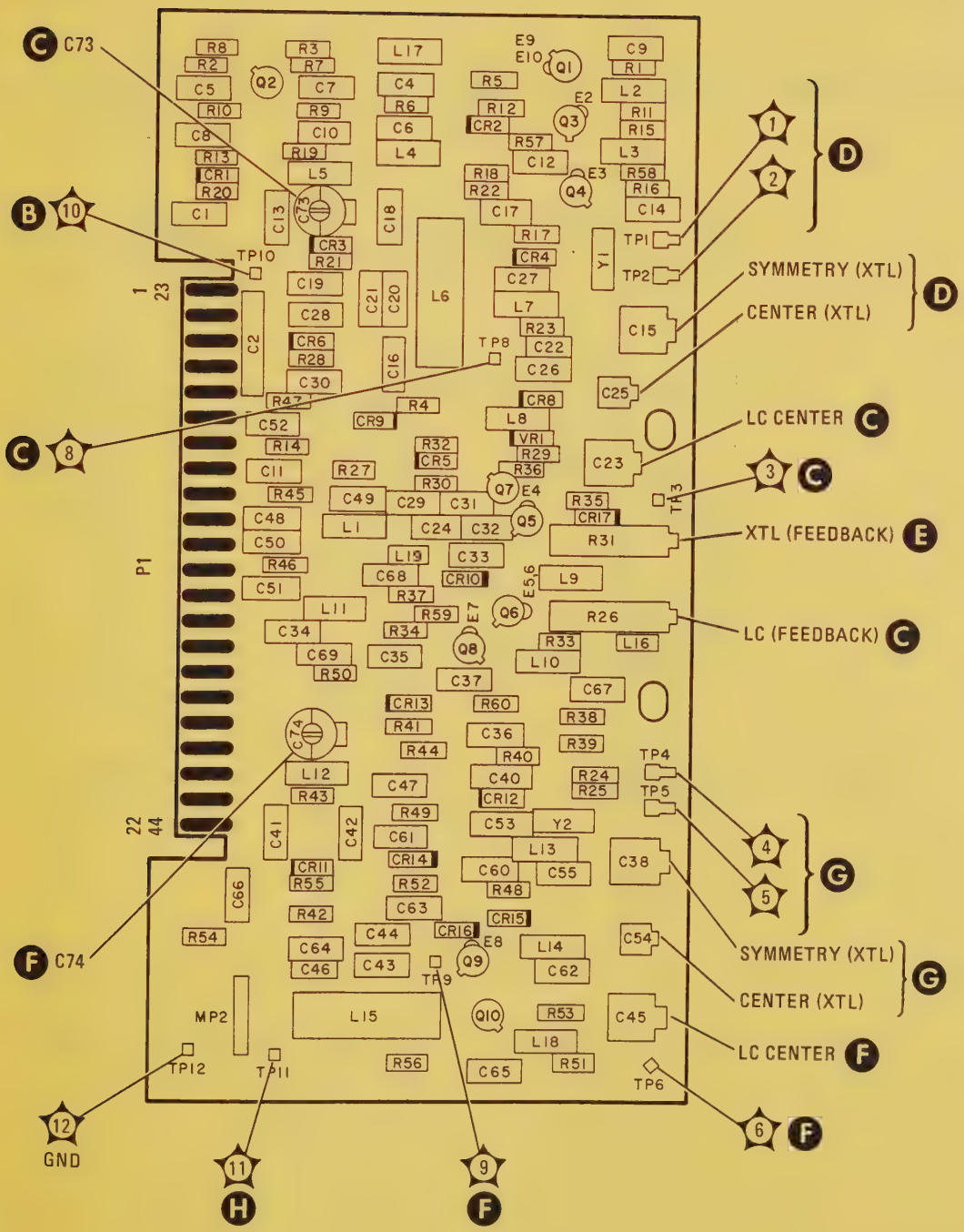


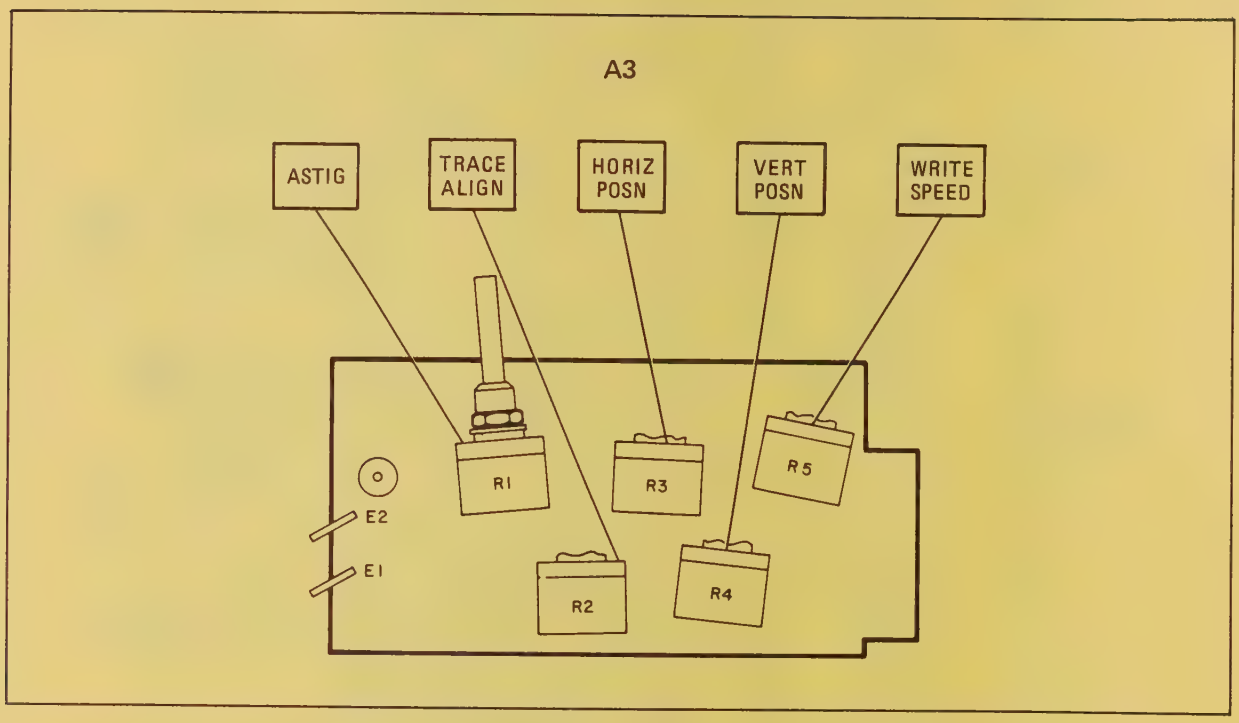
Figure 8-26. A16 Sweep Generator Assembly, Component Locations (CHANGE 21)



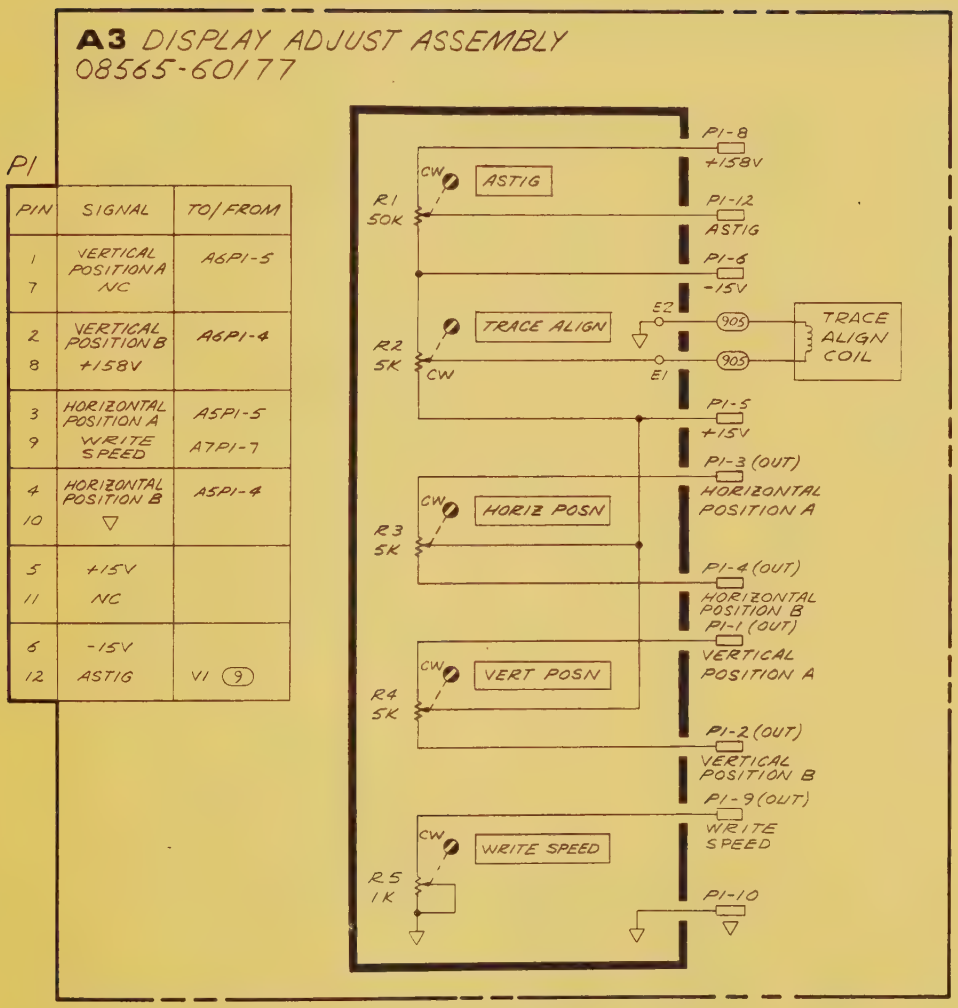
P/O Figure 8-27. A16 Sweep Generator Assembly, Schematic Diagram (CHANGE 21)



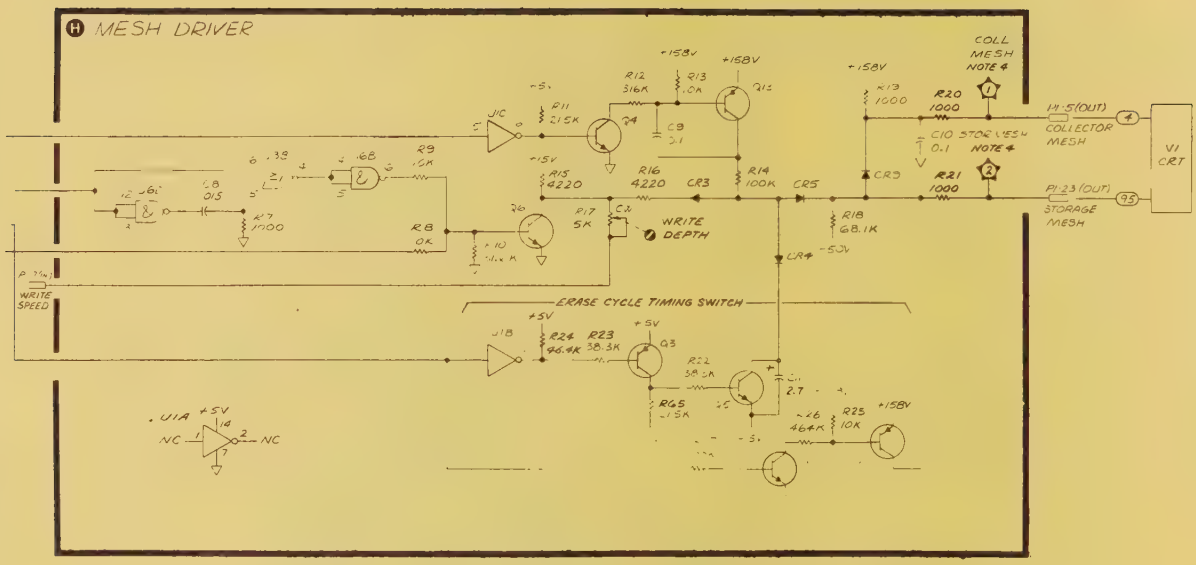
Figures 8-62 and 8-68. A23 Bandwidth Filter No. 2 Assembly and A27 Bandwidth Filter No. 1 Assembly, Component Locations (CHANGE 23)



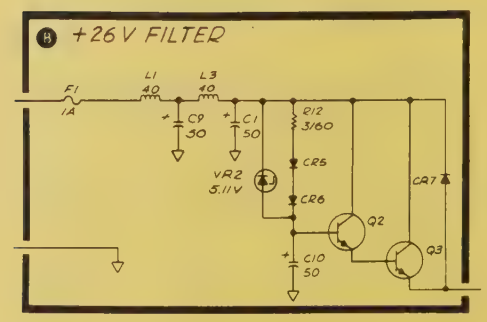
P/O Figure 8-81. A3 Display Adjust Assembly, Component Locations (CHANGE 28)



P/O Figure 8-82. A3 Display Adjust Assembly, Schematic Diagram (CHANGE 28)



P/O Figure 8-90. A7 Storage Assembly, Schematic Diagram (CHANGE 28)



P/O Figure 8-93 (CHANGE 4)

HEWLETT PACKARD

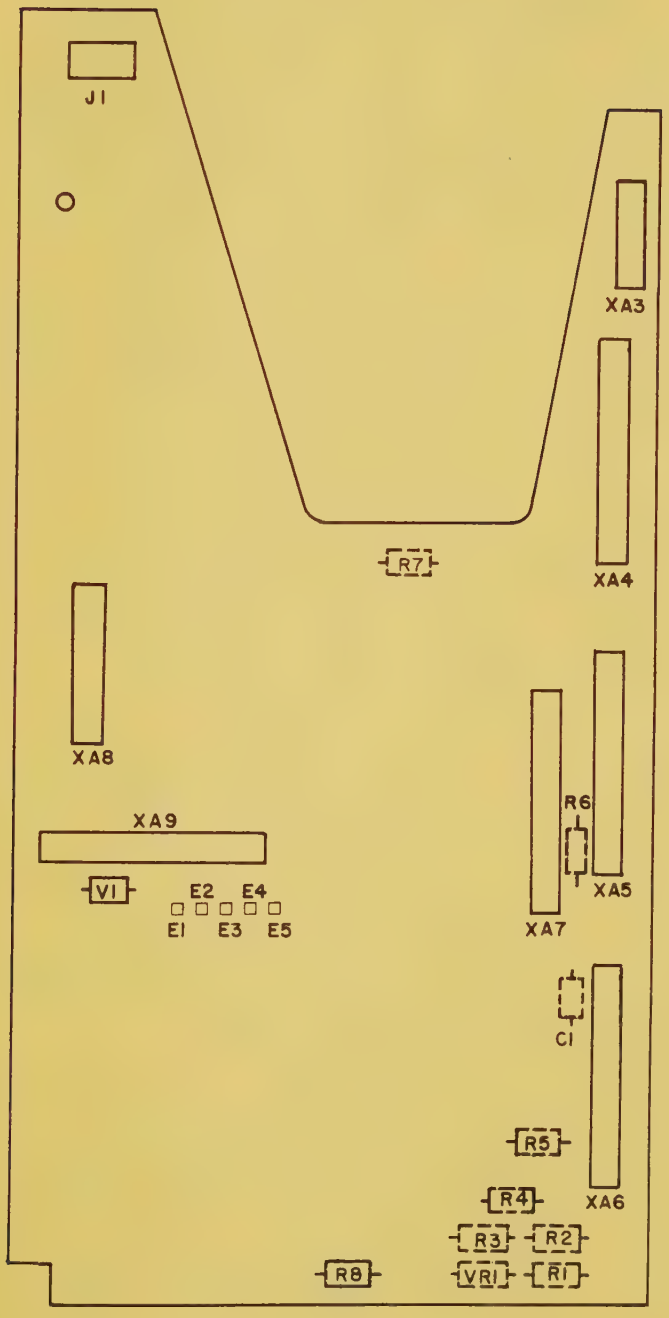
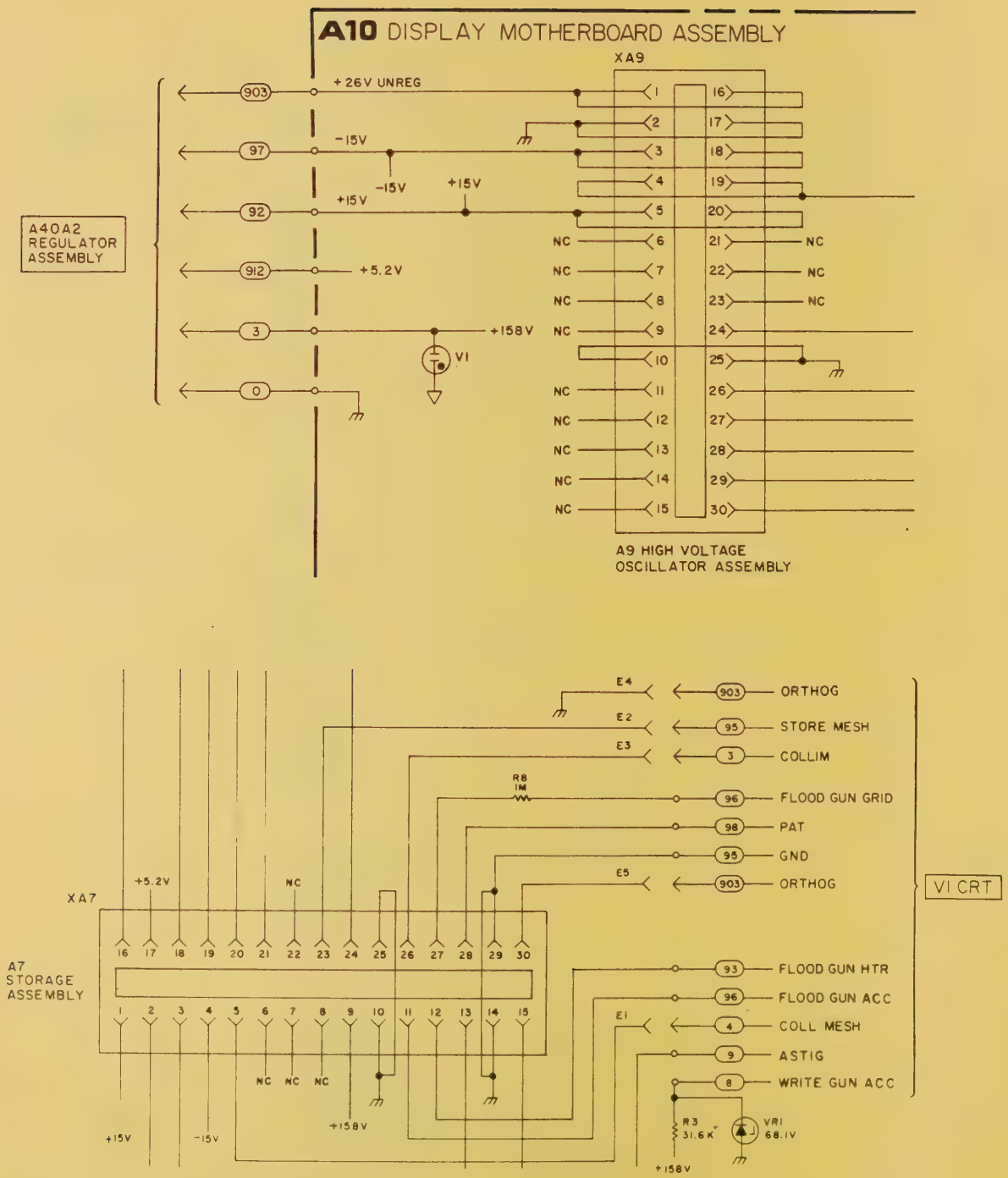


Figure 8-94. A10 Display Motherboard, Component Locations (CHANGE 13)



P/O Figure 8-95 (CHANGE 13)

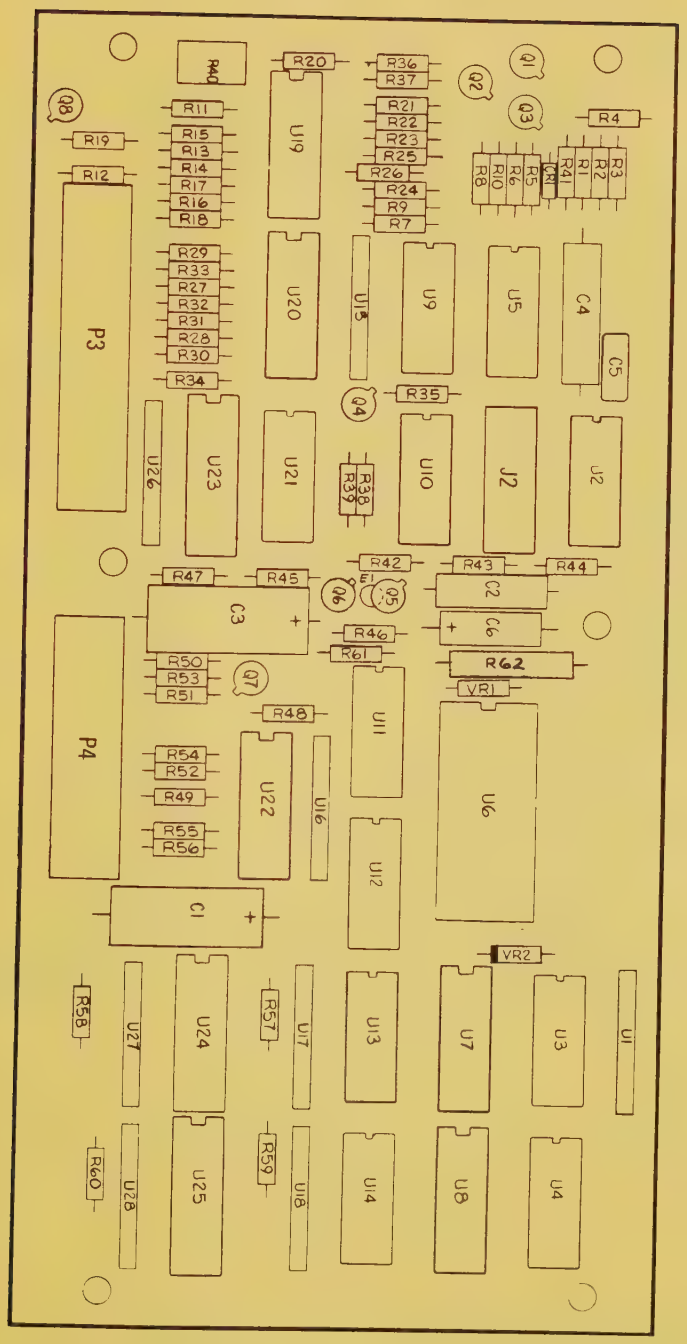
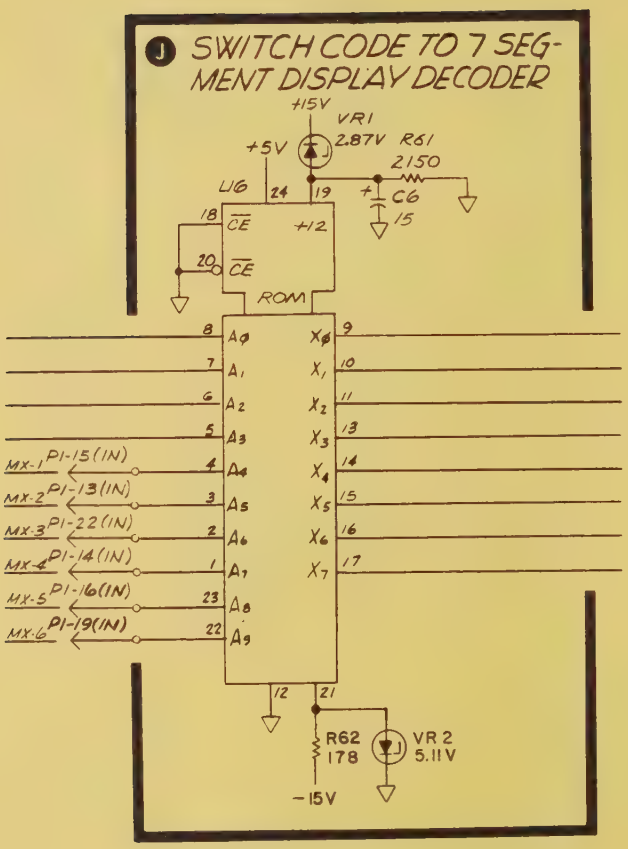


Figure 8-98. A39 Readout Driver Assembly, Component Locations (CHANGE 21)



P/O Figure 8-99. A38 Readout Driver Assembly, Schematic Diagram (CHANGE 21)

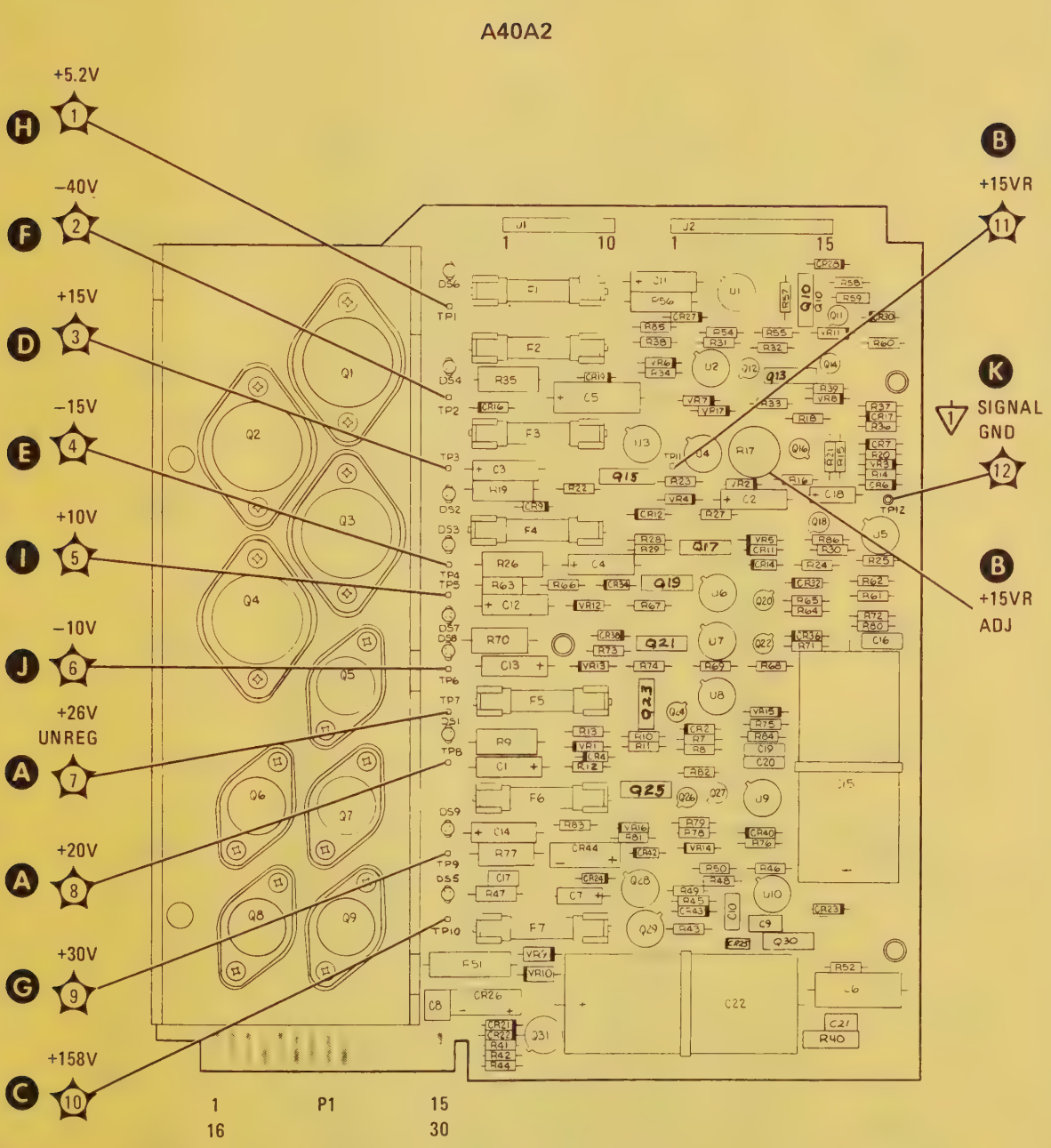


Figure 8-102. A40A2 Regulator Assembly, Component Locations (CHANGE 17)

A22

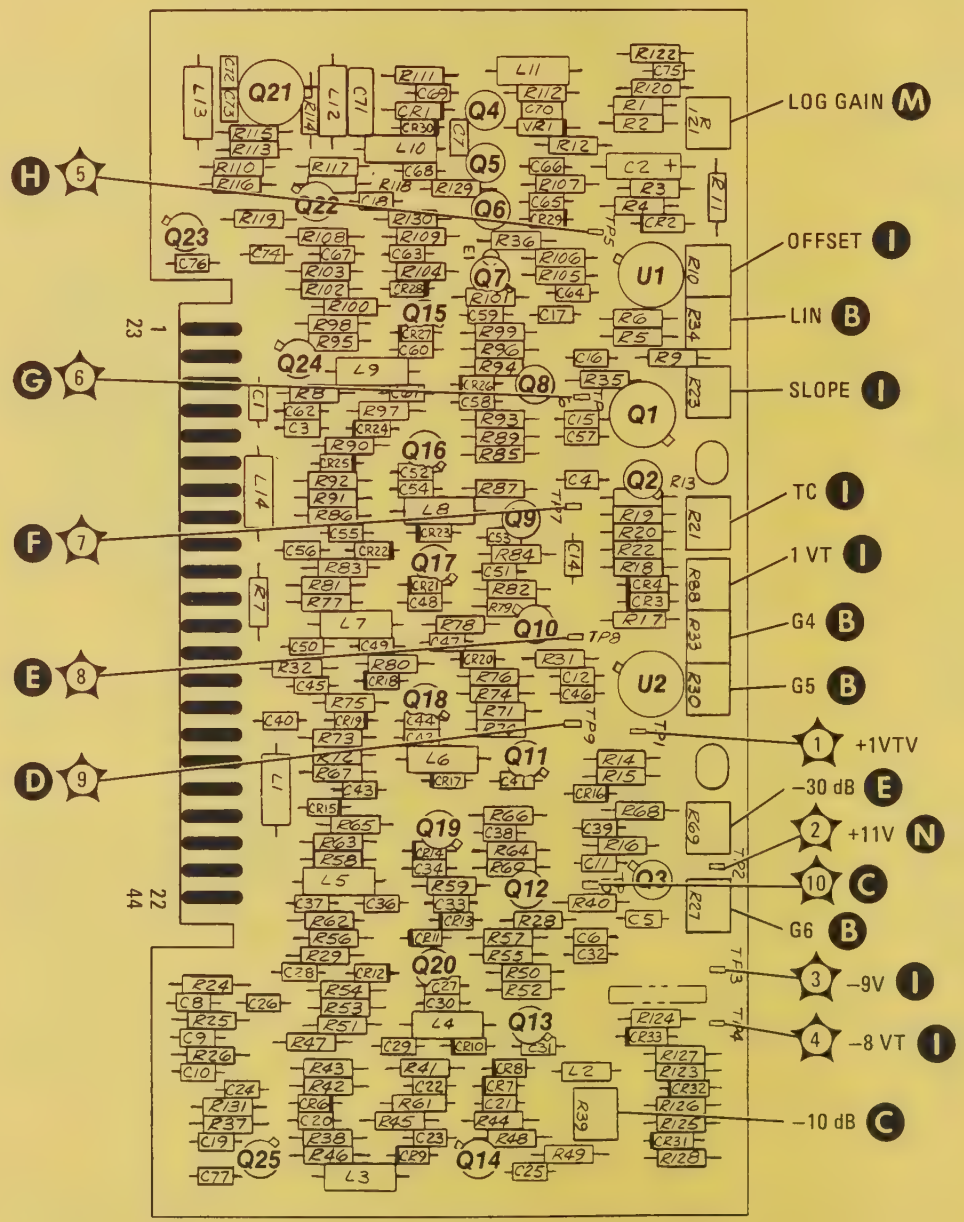


Figure 8-71. A22 Log Amplifier Assembly, Component Locations (CHANGE 29)

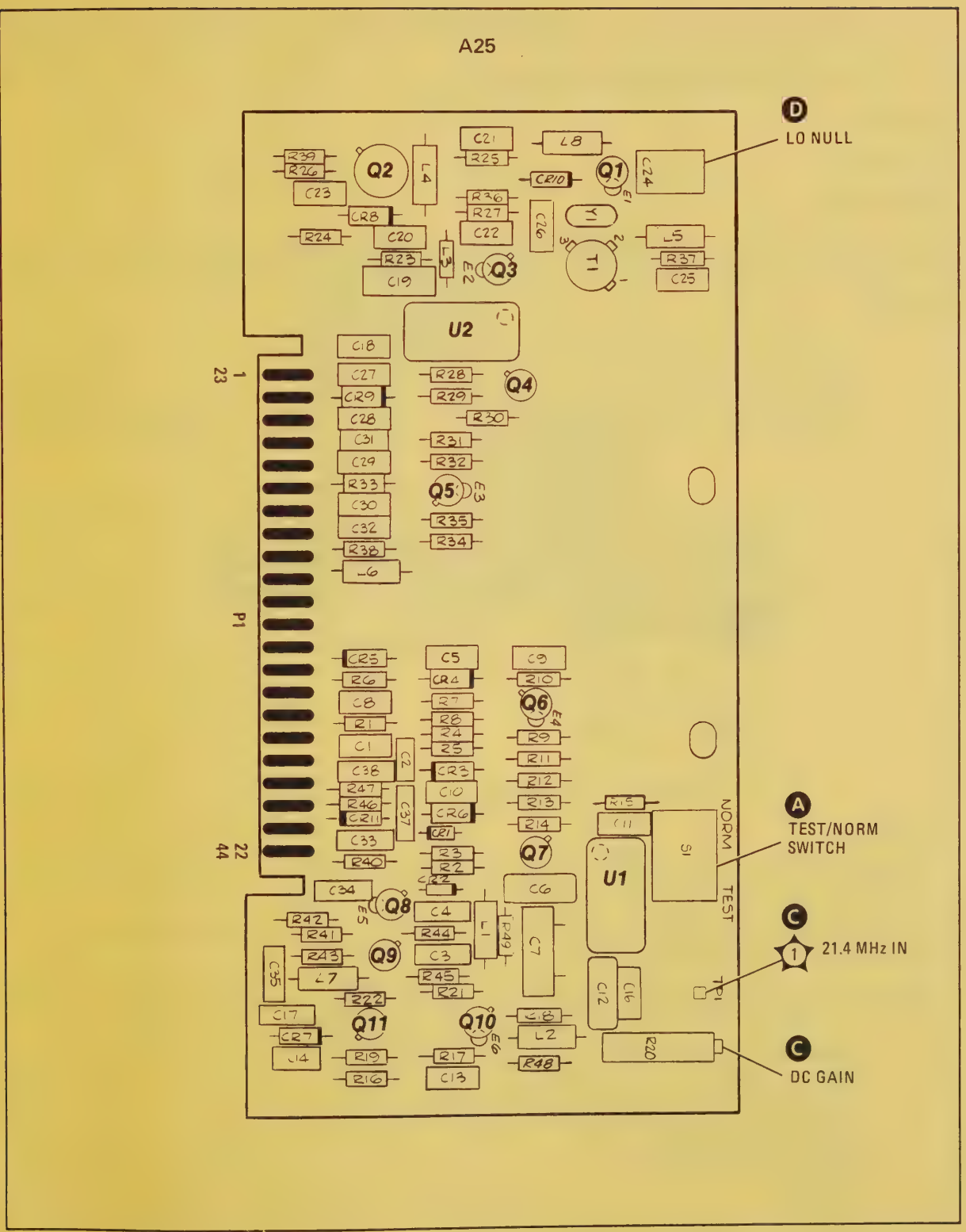


Figure 8-108. A25 Up-Down Converter Assembly (Option 100), Component Locations (CHANGE 31)

5-18. LOG AMPLIFIER ADJUSTMENT (CHANGE 29)

REFERENCE:

Service Sheet 24

DESCRIPTION:

Step attenuators are used to change spectrum analyzer input signal level in calibrated steps. The A21 Video Assembly output is monitored and adjustments are performed to calibrate the A22 Log Amplifier Assembly.

EQUIPMENT:

Up-Down Converter By Pass Board	08565-20105
Digital Voltmeter	HP 3490A
10-dB Step Attenuator	HP 355D, Option H80
1-dB Step Attenuator	HP 355C, Option H80

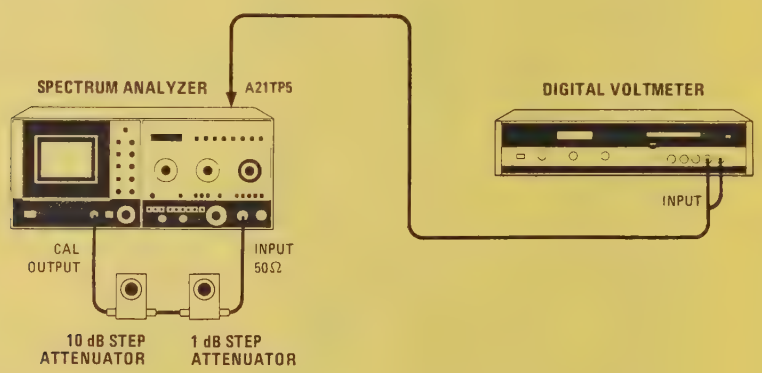


Figure 5-16. Log Amplifier Adjustment Test Setup

PROCEDURE:

a. Set LINE switch to OFF, disconnect power cord, remove 8565A top cover, and set A24S1 TEST-NORM switch to TEST position.

b. For Option 100 instruments only, install A25 Up-Down Converter Assembly. For standard instruments, install Up-Down Converter By Pass board.

c. Reconnect power cord, set LINE switch ON, and connect equipment as shown in Figure 5-16. Set normal (green) settings and other spectrum analyzer controls as follows:

FREQUENCY BAND GHz	.01–1.8
INPUT ATTEN	0 dB
REF LEVEL dBm	–50
REFERENCE LEVEL FINE	0
RESOLUTION BW	300 kHz
FREQUENCY SPAN/DIV	10 MHz
TUNING	0.100 GHz

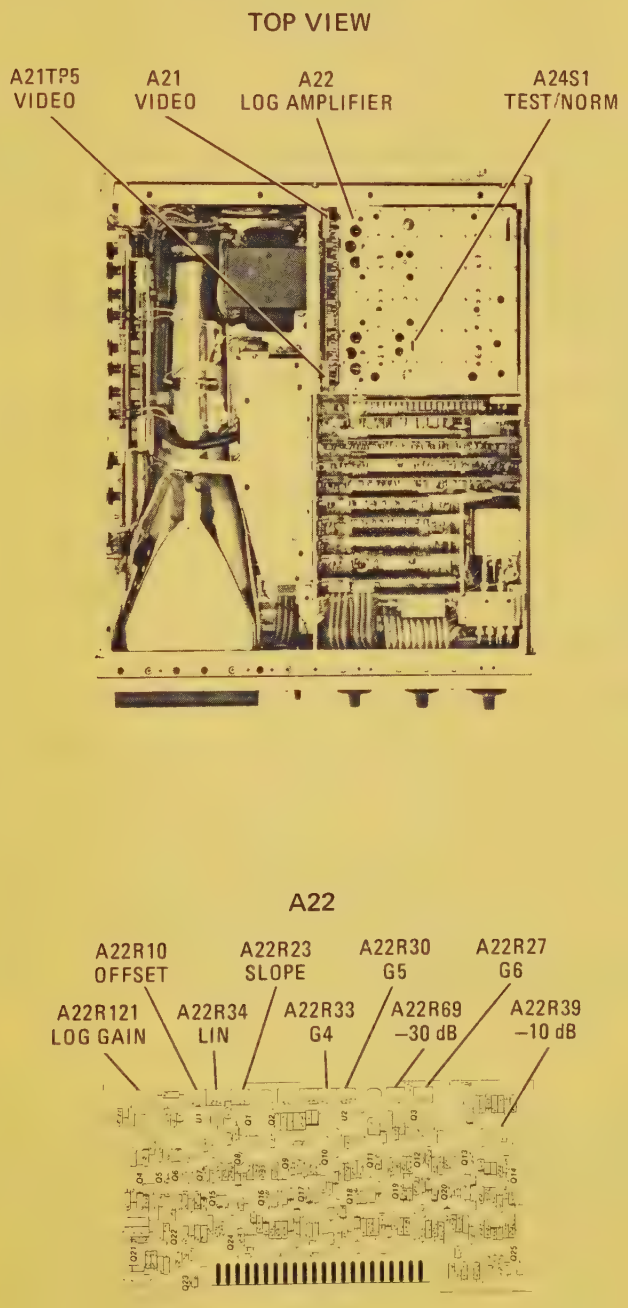


Figure 5-17. Log Amplifier Adjustment Locations

5-18. LOG AMPLIFIER ADJUSTMENT (CHANGE 29) (Cont'd)

d. Set 10 dB step attenuator to 0 dB and 1 dB step attenuator to 0 dB.

NOTE

For Option 100 only, set 1-dB step attenuator to 5 dB for all Log Amplifier adjustments.

e. Adjust front panel REF LEVEL CAL for 800 mV ±1 mV at A21TP5.

f. Adjust Tuning Control to center 100 MHz signal on CRT display. Select ZERO SPAN FREQUENCY SPAN MODE and set VIDEO FILTER to NOISE AVG. Peak signal with FINE TUNING control.

g. Adjust A22R23 SLOPE for a reading of 800 mV ±1 mV at A21TP5.

NOTE

Always keep signal peaked with FINE TUNING control for maximum output at A21TP5.

h. Set 10-dB step attenuator to 60 dB and adjust A22R10 OFFSET for 200 mV ±1 mV at A21TP5.

i. Repeat steps g and h until no further adjustment is necessary.

j. Set 10-dB step attenuator to 30 dB and adjust A22R23 SLOPE for 500 mV ±1 mV at A21TP5.

k. Set 10 dB step attenuator to 0 dB and adjust A22R69 –30 dB for 800 mV ±1 mV at A21TP5.

l. Repeat steps j and k until no further adjustment is necessary.

m. Set 10-dB step attenuator to 10 dB and adjust A22R23 SLOPE for 700 mV ±1 mV at A21TP5.

n. Set 10-dB step attenuator to 0 dB and adjust A22R39 –10 dB for 800 mV ±1 mV at A21TP5.

o. Repeat steps m and n until no further adjustment is necessary.

p. Repeat steps g through o until limits shown in Table 5-5 are met.

Table 5-5. Log Fidelity Check

STEP ATTENUATOR SETTING (dB)	DVM READING
0	800 mV Ref.
10	700 mV ±3 mV
20	600 mV ±4 mV
30	500 mV ±4 mV
40	400 mV ±5 mV
50	300 mV ±6 mV
60	200 mV ±7 mV
70	100 mV ±8 mV

5-18. LOG AMPLIFIER ADJUSTMENT (CHANGE 29) (Cont'd)

LINEAR OUTPUT and LINEAR STEP GAIN

a. Set 8565A controls as follows:

INPUT ATTENUATOR ..... 0 dB
REF LEVEL dBm ..... –50
AMPLITUDE SCALE ..... LIN

b. Set 10-dB step attenuator to 0 dB and adjust A22R34 LIN for 800 mV ±1 mV at A21TP5.

c. Make adjustments indicated in Table 5-6.

Table 5-6. Linear Gain Adjustments

ADJUST	STEP ATTENUATOR	REFERENCE LEVEL	DVM
A22R34	0	–50 dBm	800 mV Ref.
A22R33	10	–60 dBm	800 mV ±1 mV
A22R30	20	–70 dBm	800 mV ±1 mV
A22R27	30	–80 dBm	800 mV ±1 mV
No Adjustment	40	–90 dBm	800 mV ±20 mV

LOG GAIN ADJUSTMENT

a. Set 8565A controls as follows:

INPUT ATTENUATOR ..... 0 dB
REF LEVEL dBm ..... –50
AMPLITUDE SCALE ..... 1 dB

b. Set 10-dB step attenuator to 0 dB. DVM should read 800 mV ±1 mV.

c. Set 10-dB step attenuator to 40 dB. Set REF LEVEL dBm to –90 and adjust A22R121 for 800 mV ±1 mV at A21TP5.

d. Check log gain steps according to Table 5-7.

Table 5-7. Log Gain Adjustment Limits

STEP ATTENUATOR	REFERENCE LEVEL	DVM
0	–50 dBm	800 mV Ref.
10	–60 dBm	800 mV ±3 mV
20	–70 dBm	800 mV ±3 mV
30	–80 dBm	800 mV ±3 mV
40	–90 dBm	800 mV ±3 mV

5-18. LOG AMPLIFIER ADJUSTMENT (CHANGE 29) (Cont'd)

1 dB/DIV ERROR CHECK

Set 10-dB step attenuator to 0 and REFERENCE LEVEL to −50 dBm. DVM should read 800 mV ±1 mV. Step the step attenuators down in 1 dB steps as shown below to check log amplifier output with DVM.

STEP ATTENUATORS		DVM
10 dB	1 dB	
0	1	790 mV ±3 mV
0	2	780 mV ±3 mV
0	3	770 mV ±3 mV
0	4	760 mV ±3 mV
0	5	750 mV ±3 mV
0	6	740 mV ±3 mV
0	7	730 mV ±3 mV
0	8	720 mV ±3 mV
0	9	710 mV ±3 mV
10	0	700 mV ±3 mV
10	1	690 mV ±3 mV
10	2	680 mV ±3 mV
10	3	670 mV ±3 mV
10	4	660 mV ±3 mV

Table 6-2. Replaceable Parts (CHANGE 29)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A22	5061-1097	2	1	LOG AMPLIFIER ASSEMBLY	28480	5061-1097
A22C1	0160-4554	7	69	CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C2	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A22C3	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C4	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C5	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C6	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C7	0160-3879	7	1	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A22C8	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C9	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C10	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C11	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C12	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C13				NOT ASSIGNED		
A22C14	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C15	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C16	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C17	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C18	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C19	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C20	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C21	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C22	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C23	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C24	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C25	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C26	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C27	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C28	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C29	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C30	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C31	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C32	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C33	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C34	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C35				NOT ASSIGNED		
A22C36	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C37	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C38	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C39	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C40	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C41	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C42	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C43	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C44	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C45	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C46	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C47	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C48	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C49	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C50	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C51	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C52	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C53	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C54	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C55	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C56	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C57	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C58	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C59	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C60	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C61	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C62	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C63	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C64	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C65	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C66	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C67	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C68	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C69	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C70	0160-4519	4	1	CAPACITOR-FXD 9.1PF +-.5PF 200VDC CER	51642	200-200-NP0-919D
A22C71	0140-0195	2	1	CAPACITOR-FXD 130PF +-5% 300VDC MICA	72136	DM15F131J0300WV1CR
A22C72	0160-4386	3	1	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-330J

Table 6-2. Replaceable Parts (CHANGE 29)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A22C73	0160-3872	0	1	CAPACITOR-FXD 2.2PF +-.25PF 200VDC CER	28480	0160-3872
A22C74	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C75	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C76	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22C77	0160-4554	7		CAPACITOR-FXD .01UF +-20% 50VDC CER	28480	0160-4554
A22CR1	1910-0016	0	1	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A22CR2	1901-0050	3	6	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A22CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A22CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1905-0010
A22CR5				NOT ASSIGNED		
A22CR6	1901-1085	6	17	DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR7	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR8	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR9	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR10	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR11	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR12	1901-1070	9	7	DIODE-PIN 110V	28480	1901-1070
A22CR13	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR14	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR15	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR16	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR17	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR18	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR19	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR20	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR21	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR22	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR23	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR24	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR25	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR26	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR27	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR28	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR29	1901-1070	9		DIODE-PIN 110V	28480	1901-1070
A22CR30	1901-1085	6		DIODE-SM SIG SCHOTTKY	28480	1901-1085
A22CR31	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A22CR32	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A22CR33	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A22E1	9170-0029	3	1	CORE-SHIELDING BEAD	28480	9170-0029
A22L1	9100-1618	1	2	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A22L2	9140-0144	0	1	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A22L3	9140-0105	3	2	INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A22L4	9100-1619	2	2	INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A22L5	9100-1619	2		INDUCTOR RF-CH-MLD 6.8UH 10%	28480	9100-1619
A22L6	9140-0114	4	3	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A22L7	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A22L8	9140-0114	4		INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A22L9	9140-0112	2	1	INDUCTOR RF-CH-MLD 4.7UH 10%	28480	9140-0112
A22L10	9140-0105	3		INDUCTOR RF-CH-MLD 8.2UH 10%	28480	9140-0105
A22L11	9100-1627	2	1	INDUCTOR RF-CH-MLD 39UH 5% .166DX.385LG	28480	9100-1627
A22L12	9100-1629	4	1	INDUCTOR RF-CH-MLD 47UH 5% .166DX.385LG	28480	9100-1629
A22L13	9100-1622	7	1	INDUCTOR RF-CH-MLD 24UH 5% .166DX.385LG	28480	9100-1622
A22L14	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A22Q1	1854-0637	1	1	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	01295	2N2219A
A22Q2	1853-0281	9	3	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A22Q3	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A22Q4	1853-0015	7	5	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q5	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q6	1853-0007	7	1	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A22Q7	1854-0019	3	12	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q8	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q9	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q10	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q11	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q12	1853-0015	7		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q13	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q14	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q15	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q16	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q17	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q18	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q19	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q20	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q21	1854-0475	5	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A22Q22	1854-0404	0	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A22Q23	1853-0281	9		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	04713	2N2907A
A22Q24	1854-0404	0		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-2. Replaceable Parts (CHANGE 29)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A22Q25	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22R1	0757-0317	7	1	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A22R2	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R3	0698-0084	9	1	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A22R4	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A22R5	0757-0443	0	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A22R6	0757-0442	9	4	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A22R7	0757-0465	6	4	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A22R8	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A22R9	0698-3450	9	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A22R10	2100-2633	3	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	30983	ET50X102
A22R11	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A22R12	0757-0458	7	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A22R13	0757-0401	0	8	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R14	0757-0460	1	1	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A22R15	0757-0458	7		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A22R16	0757-0180	2	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A22R17	0757-0464	5	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A22R18	0698-3136	8	2	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A22R19	0698-3161	9	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A22R20	0698-0083	8	2	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A22R21	2100-2489	9	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A22R22	0698-3452	1	1	RESISTOR 147K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1473-F
A22R23	2100-2514	1	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	30983	ET50W203
A22R24	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A22R25	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A22R26	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
A22R27	2100-2489	9		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	30983	ET50X502
A22R28	0757-0346	2	14	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R29	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R30	2100-2522	1	3	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
A22R31	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R32	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R33	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
A22R34	2100-2521	0	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A22R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R36	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R37	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A22R38	0698-3151	7	1	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A22R39	2100-2520	9	1	RESISTOR-TRMR 50 20% C SIDE-ADJ 1-TRN	30983	ET50X500
A22R40	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A22R41	0757-0290	5	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A22R42	0757-0200	7	1	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A22R43	0757-0447	4	3	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A22R44	0757-0420	3	2	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A22R45	0698-3444	1	8	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R46	0698-3156	2	1	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A22R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R48	0698-3150	6	4	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A22R49	0698-3132	4	1	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A22R50	0757-0279	0	4	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A22R51	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R52	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R53	0757-0444	1	6	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R54	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R55	0757-0440	7	8	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R56	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R57	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R58	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R59	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A22R60	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R61	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R62	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R63	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R64	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R65	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R66	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R67	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R68	0698-8958	2	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0698-8958
A22R69	2100-2692	6	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	30983	ET50X105
A22R70	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R71	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A22R72	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R73	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A22R74	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R75	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F

Table 6-2. Replaceable Parts (CHANGE 29)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A22R76	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R77	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R78	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A22R79	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R80	0757-0289	2	6	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R81	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R82	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R83	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R84	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R85	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A22R86	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R87	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R88	2100-2522	1		RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	30983	ET50X103
A22R89	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R90	0757-0403	2	2	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A22R91	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R92	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R93	0698-3153	9	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A22R94	0698-3150	6		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A22R95	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R96	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R97	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R98	0757-0289	2		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A22R99	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R100	0757-0403	2		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A22R101	0698-3153	9		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A22R102	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A22R103	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R104	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R105	0698-3444	1		RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A22R106	0757-0417	8	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A22R107	0757-0199	3	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A22R108	0698-3434	9	1	RESISTOR 34.8 1% .125W F TC=0+-100	24546	C4-1/8-T0-34R8-F
A22R109	0757-0400	9	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A22R110	0757-0418	9	2	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A22R111	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A22R112	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R113	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R114	0698-3136	8		RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A22R115	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R116	0757-0418	9		RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A22R117	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R118	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A22R119	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A22R120	0757-0439	4	1	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A22R121	2100-2633	5		RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	30983	ET50X102
A22R122	0757-0420	3		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A22R123	0757-0440	7		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A22R124	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A22R125	0757-0447	4		RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A22R126	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A22R127	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A22R128	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A22R129	0698-0083	8		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A22R130	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A22R131	0757-0402	1	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A22TP1	0360-0535	0	10	TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP2	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP3	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP4	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP5	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP6	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP7	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP8	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP9	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22TP10	0360-0535	0		TERMINAL TEST POINT PCB	00000	ORDER BY DESCRIPTION
A22U1	1826-0092	3	2	IC OP AMP GP DUAL TO-99 PKG	28480	1826-0092
A22U2	1826-0092	3		IC OP AMP GP DUAL TO-99 PKG	28480	1826-0092
A22VR1	1902-0901	5	1	DIODE-ZNR 5.4V 1% DO-7 PD=.4W TC=+.018%	28480	1902-0901
				A22 MISCELLANEOUS PARTS		
	08565-00131	2	1	COVER-LOG AMPLIFIER	28480	08565-00131

See introduction to this section for ordering information
*Indicates factory selected value

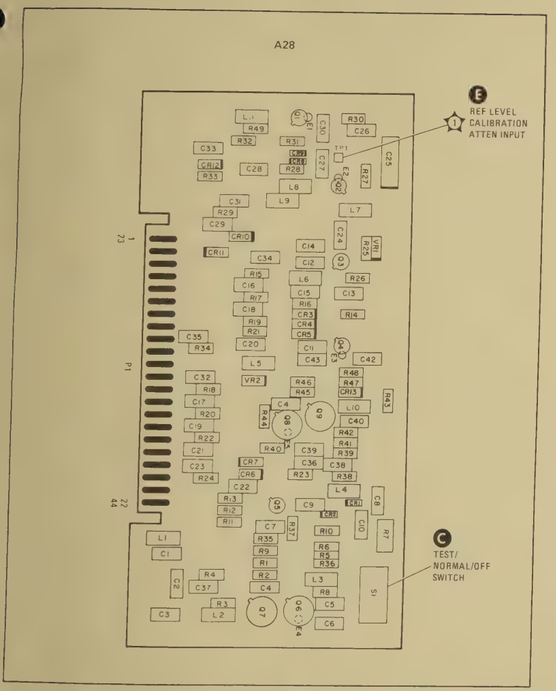
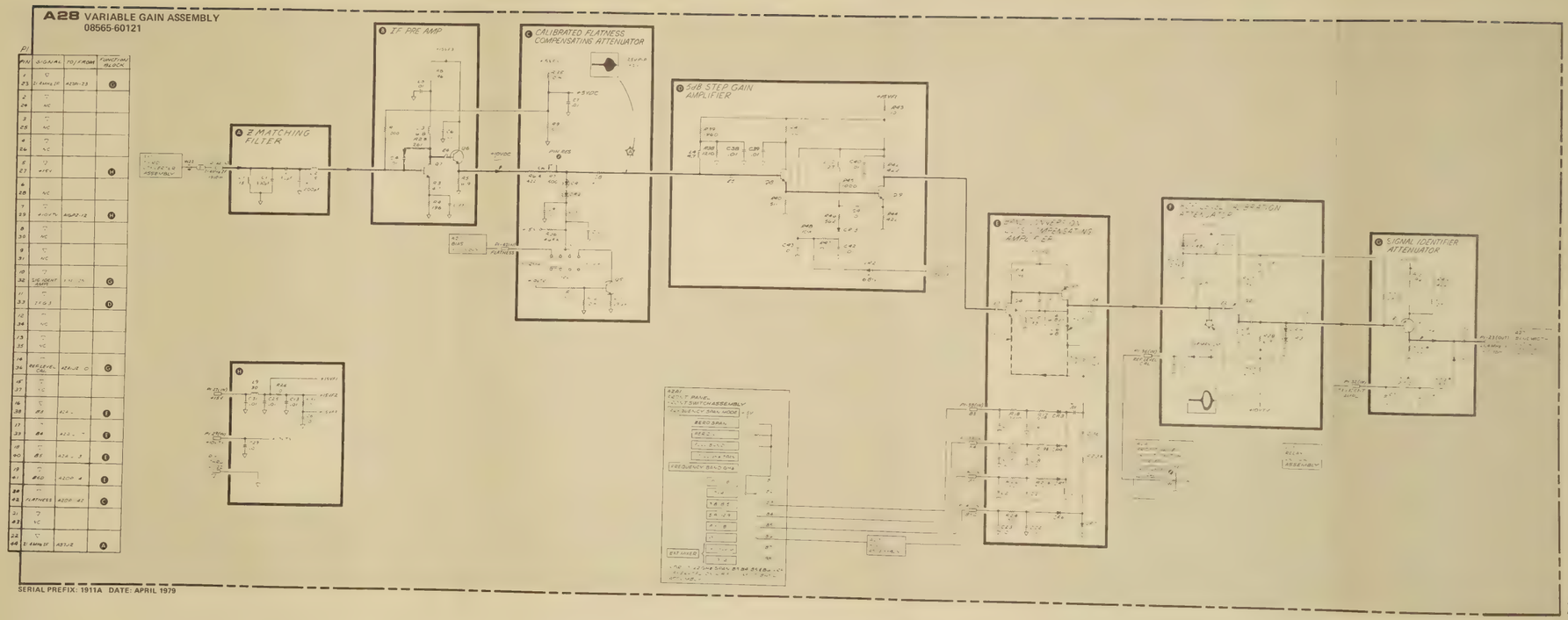


Figure 8-58. A28 Variable Gain Assembly, Component Locations (CHANGE 18)



NOTES:

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (μF) INDUCTANCE IN MICROHENRIES (μH)
3. *ASTERISK INDICATES FACTORY SELECTED COMPONENT. NOMINAL VALUE IS SHOWN.
4. —∅— INDICATES SHIELDING BEAD.
5. SIGNAL LEVELS & TEST POINT WAVEFORMS ASSUME THE FOLLOWING SETTINGS:
   GREEN (NORMAL) SETTINGS
   FREQUENCY SPAN/DIV: 1 MHz
   FREQUENCY BAND: .01 - 1.8 GHz
   INPUT ATTEN: 0 dB
   REFERENCE LEVEL: –10 dBm
   100 MHz –10 dBm (CAL OUTPUT) INTO INPUT
   ANALYZER TUNED TO SIGNAL
6. REFERENCE DESIGNATORS

A28	
LAST USED	NOT USED
C43	
CR13	
E5	
L11	
P1	
Q9	
R49	
S1	
VR2	

Figure 8-59. A28 Variable Gain Assembly, Schematic Diagram (CHANGE 18)

A29 RF-IF MOTHERBOARD
08565-60029

ERRATA: JUNE 1980

Figure 8-27. A29 RF-IF Motherboard, Schematic Diagram (1 of 2) (ERRATA)

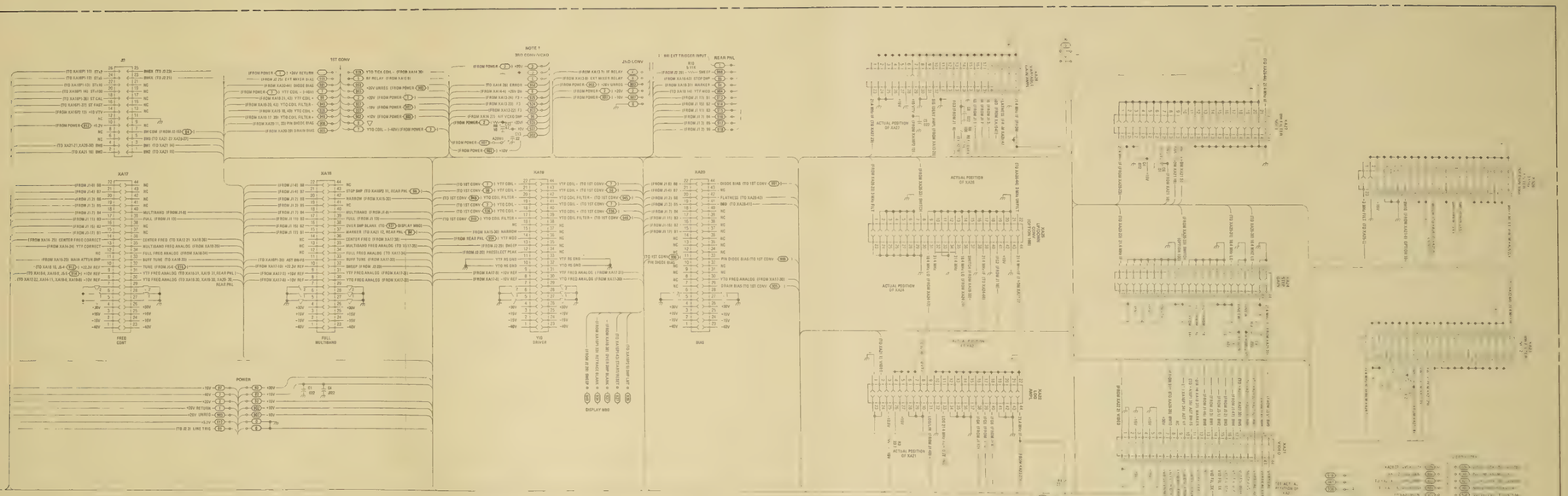
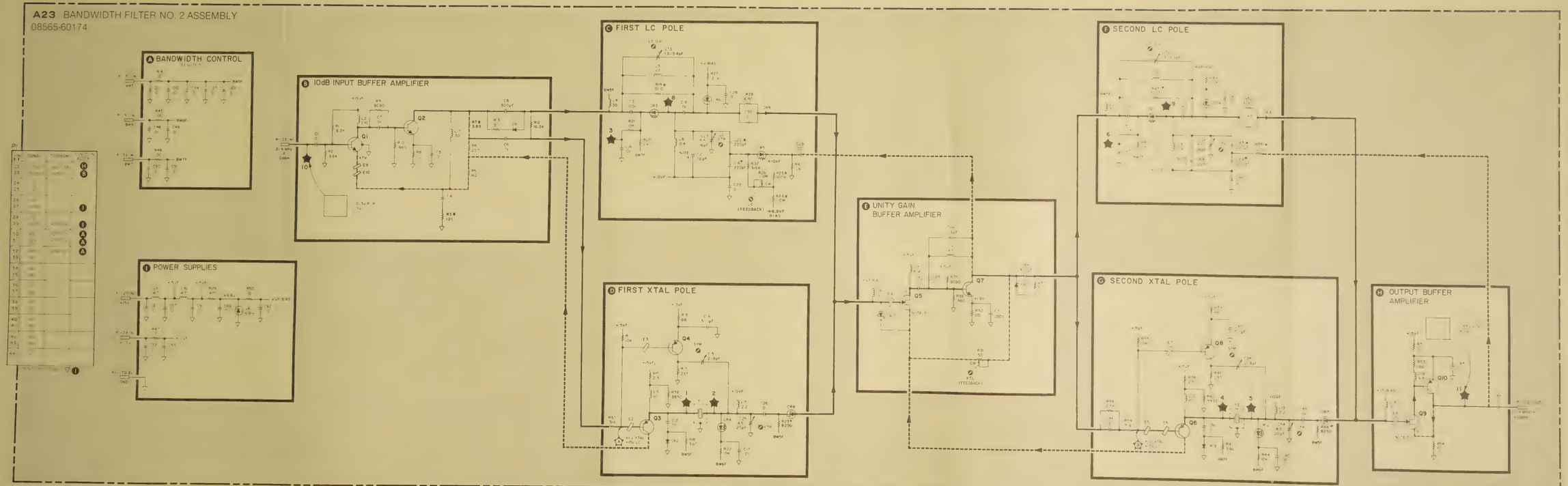


Figure 8-77. A29 RF-IF Motherboard, Schematic Diagram (2 of 2) (ERRATA)

A23 BANDWIDTH FILTER NO. 2 ASSEMBLY
08565-60174



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (μF) INDUCTANCE IN MICROHENRIES (μH)
3. ASTERISK (*) INDICATES FACTORY SELECTED COMPONENT. NOMINAL VALUE IS SHOWN.
4. TEMPERATURE COMPENSATING CAPACITOR.
5. SOURCE VOLTAGE SHOULD BE .2V TO 1.5V GREATER THAN THE GATE VOLTAGE
6. VOLTAGES SHOULD BE MEASURED WITH 1 KΩ OR GREATER AT PROBE TIP TO PREVENT OSCILLATION AND ERRONEOUS READINGS.
7. REFER TO A9 SWEEP GENERATOR/ BANDWIDTH CONTROL SCHEMATIC FOR DETAILS ON BANDWIDTH CONTROL.

BANDWIDTH	BW5	XTAL BW6	LC BW7
3 MHz	-14.8V	≤-4V	+ 5V
1 MHz	-14.8V	≤-4V	+ 8.5V
300 kHz	-14.8V	≤-4V	+ 9.5V
100 kHz	-14.8V	≤-4V	+10V
30 kHz	- 5V	+10V	≥+10V
10 kHz	- 5V	+ 9.5V	≥+10V
3 kHz	- 5V	+ 8.5V	≥+10V
1 kHz	5V	+ 5V	≥+10V

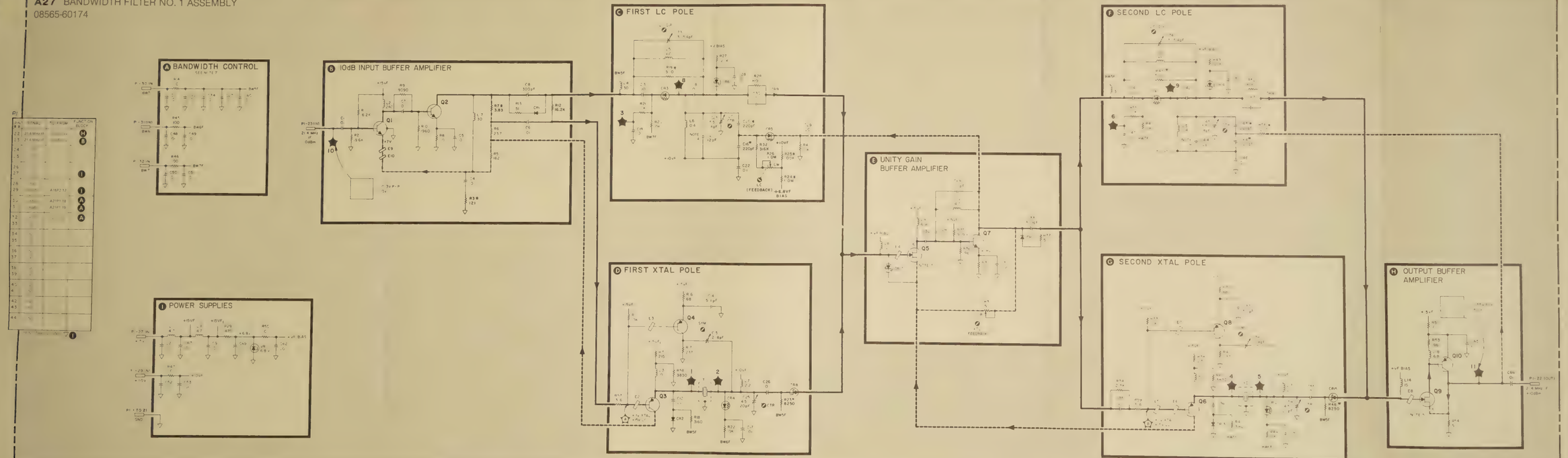
8. TP7 IS NOT ASSIGNED.
9. MNEMONIC TABLE

MNEMONIC	DESCRIPTION
BW5 BW6 BW7	BANDWIDTH CONTROL LINES

SERIAL PREFIX: 2009A DATE: MARCH 1980

A23

A27 BANDWIDTH FILTER NO. 1 ASSEMBLY
08565-60174



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED RESISTANCE IN OHMS (Ω) CAPACITANCE IN MICROFARADS (μF) INDUCTANCE IN MICROHENRIES (μH)
3. ASTERISK (*) INDICATES FACTORY SELECTED COMPONENT NOMINAL VALUE IS SHOWN
4. TEMPERATURE COMPENSATING CAPACITOR
5. SOURCE VOLTAGE SHOULD BE 2V TO 1.5V GREATER THAN THE GATE VOLTAGE
6. VOLTAGES SHOULD BE MEASURED WITH 1 KΩ OR GREATER AT PROBE TIP TO PREVENT OSCILLATION AND ERRONEOUS READINGS
7. REFER TO A9 SWEEP GENERATOR BANDWIDTH CONTROL SCHEMATIC FOR DETAILS ON BANDWIDTH CONTROL

BANDWIDTH	BW5	XTAL BW6	LC BW7
3 MHz	-13.5%	4%	-5%
1 MHz	-13.5%	4%	-5.5%
300 kHz	-13.5%	4%	-4.5%
100 kHz	-13.5%	4%	-10%
30 kHz	5%	-10%	+10%
10 kHz	5%	-9.5%	+10%
3 kHz	5%	-8.5%	+10%
1 kHz	5%	+5%	+10%

8. TP7 IS NOT ASSIGNED.
9. MNEMONIC TABLE

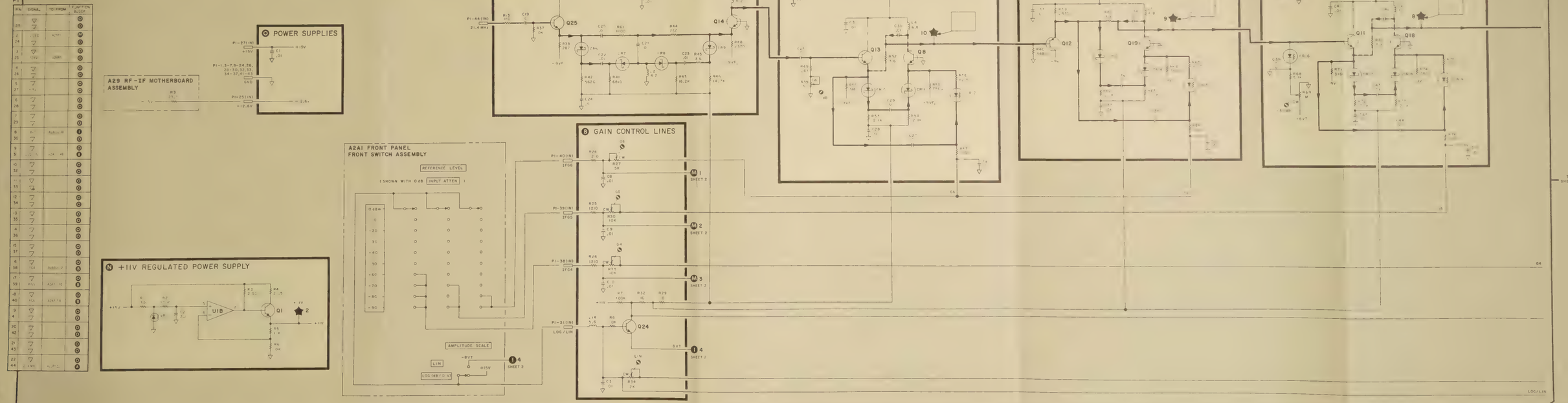
MNEMONIC	DESCRIPTION
BW5, BW6, BW7	BANDWIDTH CONTROL LINES

SERIAL PREFIX: 2009A DATE: MARCH 1980

A27

Figure 8-63. A27 Bandwidth Filter No. 1 Assembly, Schematic Diagram (CHANGE 23)

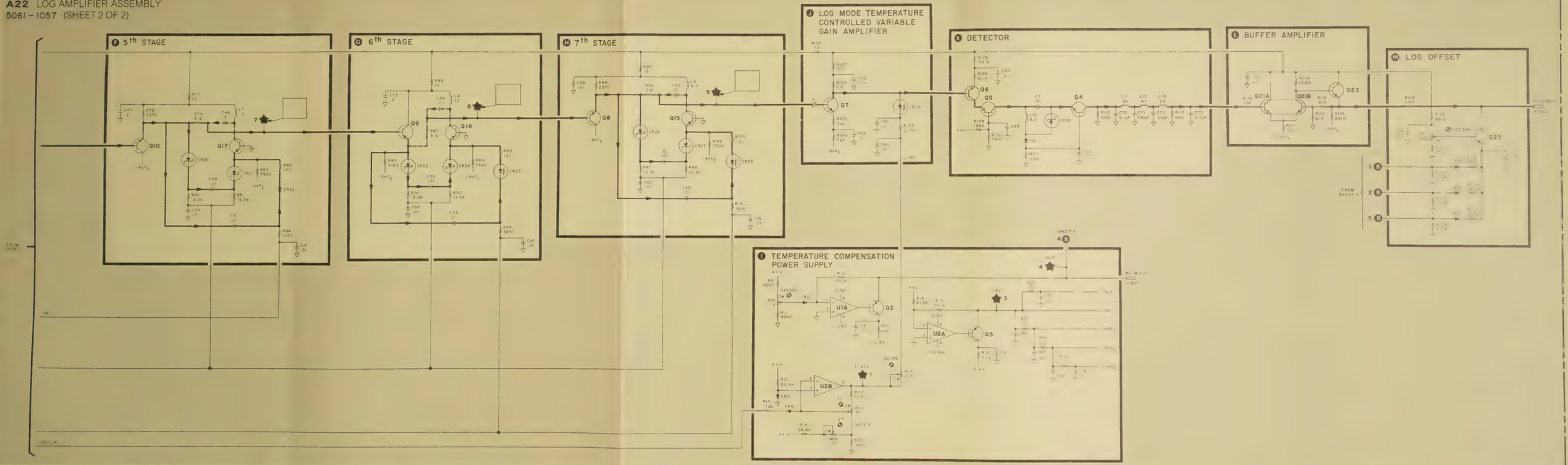
A22 LOG AMPLIFIER ASSEMBLY
5061 – 1057 (SHEET 1 OF 2)



A22

Figure 8-72. A22 Log Amplifier Assembly, Schematic Diagram (1 of 2) (CHANGE 29)

A22 LOG AMPLIFIER ASSEMBLY
5061 – 1057 (SHEET 2 OF 2)



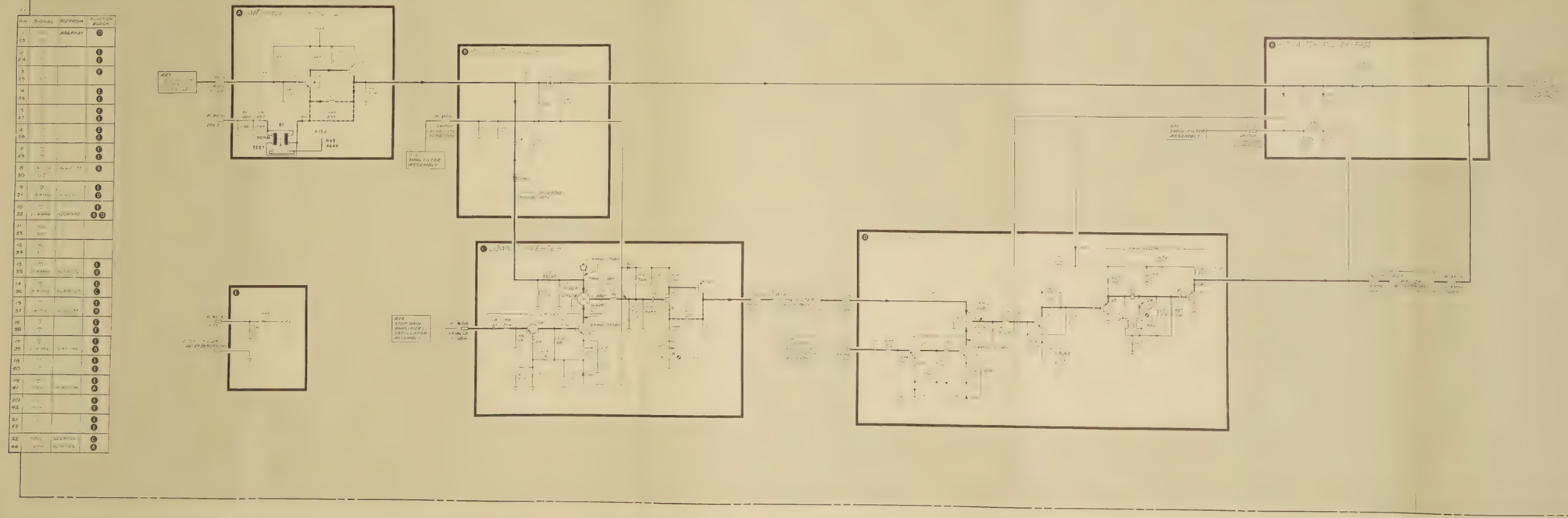
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (μF)
   INDUCTANCE IN MICROHENRIES (μH)
3. * ASTERISK DENOTES FACTORY SELECTED COMPONENT. NOMINAL VALUE SHOWN.
4. SIGNAL LEVELS AND TEST POINT WAVEFORM ASSUME THE FOLLOWING SETTINGS:
   GREEN (NORMAL) SETTINGS
   FREQUENCY SPAN/DIV: 5 MHz
   RESOLUTION BW: 1 MHz
   FREQUENCY BAND: .01–1.8 GHz
   INPUT ATTEN: 0 dB
   REF LEVEL: –10 dBm
   100 MHz –10 dBm (CAL OUTPUT) SIGNAL INTO INPUT
   ANALYZER TUNED TO SIGNAL
5. R21 TC AND R88 1VT FACTORY ADJUSTABLE ONLY.
6. MNEMONIC TABLE:

MNEMONIC	DESCRIPTION
IFG4 IFG5 IFG6	IF GAIN CONTROL LINES
LOG/LIN	SELECTS EITHER LOG OR LINEAR

Figure 8-72. A22 Log Amplifier Assembly, Schematic Diagram (2 of 2) (CHANGE 29)

A25 UP-DOWN CONVERTER ASSEMBLY
08565-60195



NOTES

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE DESIGNATOR, PREFIX WITH ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (μF)
   INDUCTANCE IN MICROHENRIES (μH)
3. —⏚— DENOTES SHIELDING BEAD.
4. * ASTERISK DENOTES FACTORY SELECTED COMPONENT. NOMINAL VALUE SHOWN.
5. TOP VIEW T1:

Figure 8-109. A25 Up-Down Converter Assembly (Option 100), Schematic Diagram (CHANGE 31)

HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

8565A
SPECTRUM ANALYZER

Includes Options 100, 200, and 400

SERIAL NUMBERS

This manual applies directly to HP Model 8565A Spectrum Analyzer having serial prefix number 1712A.

For additional important information about serial numbers see INSTRUMENTS COVERED BY MANUAL in Section I.

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1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA, U.S.A.

MANUAL PART NO. 08565-90014
MICROFICHE PART NO. 08565-90015

Printed: August 1977

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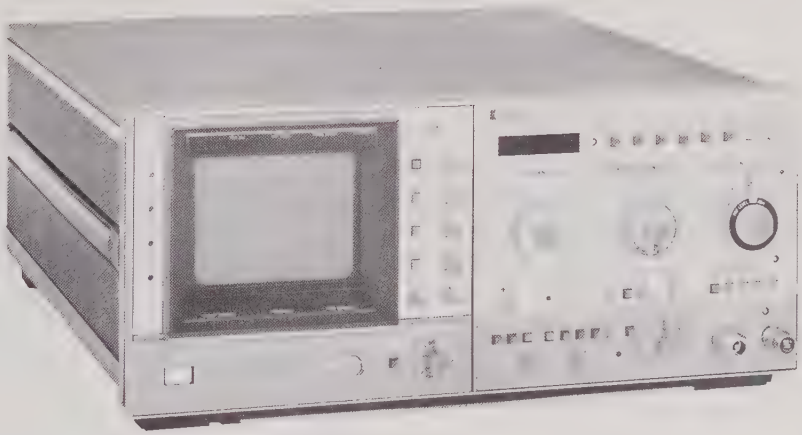


HP 8565A

LINE POWER CABLE

(SEE TABLE 2-2 FOR
HP PART NUMBER)

Figure 1-1. Model 8565A Spectrum Analyzer With Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Operating and Service Manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard Model 8565A. Figure 1-1 shows the instrument and accessories supplied. This section covers instrument identification, description, options, accessories, specifications, and other basic information.

1-3. This manual is divided into eight sections which provide information as follows:

a. SECTION I, GENERAL INFORMATION, contains the instrument description and specifications as well as the accessory and recommended test equipment list.

b. SECTION II, INSTALLATION/INCOMING INSPECTION, contains information relative to receiving inspection, preparation for use, mounting, packing, shipping, and incoming inspection.

c. SECTION III, OPERATION, contains instructions for operating the instrument.

d. SECTION IV, PERFORMANCE TESTS, contains information required to verify that instrument performance is in accordance with published specifications.

e. SECTION V, ADJUSTMENTS, contains information required to properly adjust and align the instrument after repair.

f. SECTION VI, REPLACEABLE PARTS, contains information required to order all parts and assemblies.

g. SECTION VII, MANUAL BACKDATING CHANGES, contains backdating information to make this manual compatible with earlier equipment configurations.

h. SECTION VIII, SERVICE, contains descriptions of the circuits, schematic diagrams, parts location diagrams, and troubleshooting procedure to aid the user in maintaining the instrument.

1-4. Supplied with this manual is an Application Note entitled "Operating the 8565A Spectrum Analyzer." This Application Note should be kept with the instrument for use by the operator.

1-5. SPECIFICATIONS

1-6. Instrument specifications are listed in Table 1-1. These specifications are the performance standards or limits against which the instrument is tested. Table 1-2 lists supplemental characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

NOTE

To ensure that the 8565A meets specifications listed in Table 1-1, Performance Tests (Section IV) should be performed every six months.

1-7. SAFETY CONSIDERATIONS

1-8. General

1-9. This is a Safety Class I instrument and has been manufactured and tested according to international safety standards.

1-10. Operation

1-11. BEFORE APPLYING POWER make sure the instrument's ac input is set for the available ac line voltage, that the correct fuse is installed, and that all normal safety precautions have been taken. (See Warnings below).

Table 1-1. Model 8565A Specifications (1 of 3)

SPECIFICATIONS

FREQUENCY SPECIFICATIONS

FREQUENCY RANGE

Internal mixer 0.01 to 22 GHz

Covered in six ranges selectable by Frequency Band pushbuttons (in GHz): .01 to 1.8; 1.7 to 4.1; 3.8 to 8.5; 5.8 to 12.9; 8.5 to 18; 10.5 to 22.

External mixer HP 11517A 14.5 to 40 GHz

Covered in two ranges selectable by Frequency Band pushbuttons (in GHz) : 14.5 to 26.6 (6+ harmonic mode); 22.9 to 40 (10+ harmonic mode).

Tuning Accuracy

The overall tuning accuracy of the digital Frequency readout in any span mode:

Internal mixing

.01 to 2.5 GHz < ±5 MHz ±20% of Frequency Span/Div
2.5 to 22 GHz < ±0.2% ±20% of Frequency Span/Div

External mixing

14.5 to 40 GHz < ±0.7% ±20% of Frequency Span/Div

Digital readout resolution (included in tuning accuracy)

Internal mixing 1 MHz; External mixing 10 MHz

FREQUENCY SPANS (on a 10 division CRT horizontal axis)

1.7 to 22 GHz

Multiband span of spectrum from 1.7 to 22 GHz in one sweep. The frequency (position) corresponding to the tuning marker is set by the Tuning control and indicated in GHz by the digital Frequency displays on the front panel and the CRT bezel.

Full Band

Displays spectrum of entire Frequency Band selected. Tuning marker displayed in Full Band mode (becomes center frequency when Per Division mode is selected). Marker frequency is given on the digital displays.

Per Division

Eighteen calibrated spans from 1 kHz/div to 500 MHz/Div in a 1, 2, 5, 10 sequence. In "F" position the entire Frequency Band selected is spanned.

Span width accuracy

The frequency error for any two points on the display for spans from 500 MHz to 20 kHz/Div (unstabilized) is less than ±5% of the indicated separation; for stabilized spans 100 kHz/Div and less, the error is less than ± 15%.

Center Frequency

The center frequency represented by the CRT is indicated in GHz by the digital Frequency displays on the front panel and the CRT bezel.

Zero Span

Analyzer becomes a manually tuned receiver (for the time domain display of signal modulation) set to the frequency indicated in GHz by the digital Frequency displays.

SPECTRAL RESOLUTION AND STABILITY

Resolution Bandwidths

Resolution (3 dB) Bandwidths from 1 kHz to 3 MHz in 1, 3, 10 sequence. Bandwidth may be varied independently or coupled to Frequency Span/Div control. Optimum coupling (best ratio of Frequency Span/Div to Resolution Bandwidth) is indicated by alignment of markers (▶◀) on both controls.

Uncoupled, the controls for Frequency Span/Div and Resolution Bandwidth may be independently set so any resolution bandwidth (3 MHz to 1 kHz) may be used with any span width (F and 500 mHz to 1 kHz/Div).

Resolution Bandwidth accuracy

Individual resolution bandwidth 3 dB points: < ±15%.
Selectivity: (60 dB/3 dB bandwidth ratio) < 15:1 for bandwidths 1 kHz to 3 MHz.

Stability

Total residual FM

Stabilized: <200 Hz p-p in 0.1 sec .01 – 8.5 GHz
Unstabilized: <10 kHz p-p in 0.1 sec .01 – 4.1 GHz
(Fundamental mixing)

Stabilization range: First LO automatically stabilized (unless auto stabilizer is OFF) for frequency spans 100 kHz/div or less.

Noise sidebands: At least 70 dB down, greater than 30 kHz from center of CW signal when set to a 1 kHz Resolution Bandwidth and a 10 Hz (.01) Video Filter.

Video Filter

Post detection low-pass filter used to average displayed noise for a smooth trace. Nominal settings are given as decimal fractions of the Resolution Bandwidth: OFF, .3, .1, .03, .01, and .003. A 1 Hz NOISE AVG (noise averaging) setting is provided for noise level measurement.

AMPLITUDE SPECIFICATIONS

AMPLITUDE RANGE — Internal mixer

(Amplitude specifications for the HP 8565A Spectrum Analyzer with the HP 11517A External Mixer are given near the end of Table 1-1.)

Measurement range:

Damage levels:

Total power: +30 dBm (1 watt)
dc: 0V with 0 dB Input attenuation
± 7V with ≥ 10 dB Input attenuation
ac: (<50Ω nominal source impedance):
0V with 0 dB Input attenuation
10V peak with ≥ 10 dB Input attenuation

Gain compression:

For signal levels below MAXIMUM input setting, gain compression is less than 1 dB.

Table 1-1. Model 8565A Specifications (2 of 3)

Average noise level:
Sensitivity (minimum discernible signal) is given by the signal level which is equal to the average noise level, causing approximately a 3 dB peak above the noise. Maximum average noise level with 1 kHz Resolution Bandwidth (0 dB attenuation and 0.003 (3 Hz) video filter) is given in the table below:

Frequency Band (GHz)	First IF in MHz	Harmonic Mode	Avg. Noise Level (dBm)
.01-1.8	2050	1–	–110
1.7-4.1	321.4	1–	–106
3.8-8.5	321.4	2–	–102
5.8-12.9	321.4	3–	–92
8.5-18	321.4	4+	–83
10.5-22	321.4	5+	–72

Reference Level

Reference Level range: +70 dBm[1] to –102 dBm in 10 dB steps and continuous 0 to –12 dB calibrated vernier.

Reference Level accuracy:
With Sweep Time/Division control in Auto setting, the optimum sweep rate is selected automatically for any combination of Frequency Span/Div, Resolution Bandwidth and Video Filter settings. Thus, the Auto Sweep setting insures a calibrated amplitude display within the following limits:

Calibrator output
–10 dBm ±0.3 dB
100 MHz ±10 kHz

Reference Level variation (Input Attenuator at 0 dB)

10 dB Steps: < ±0.5 dB (0 to –70 dBm)
< ±1.0 dB (0 to –90 dBm)

Vernier (0 to –12 dB) continuous: Maximum error <±0.5 dB, when read from Reference Level Fine control.

Input Attenuator (at preselector input, 70 dB range in 10 dB steps)

Step size variation (for steps from 0 to 60 dB):
< ±1.0 dB .01 to 18 GHz

Maximum cumulative Error (from 0 to 60 dB):
< ±2.4 dB .01 to 18 GHz

Frequency Response (with 0 or 10 dB of Input Attenuation)
Frequency response includes input attenuator, preselector and mixer frequency response plus mixing mode gain variation (band to band).

Frequency Band (GHz)	Frequency Response (± dB MAX.)
0.01 to 1.8	1.2
1.7 to 4.1	1.7
3.8 to 8.5	2.2
5.8 to 12.9	2.5
8.5 to 18	3.0
10.5 to 22	4.5

Switching between bandwidths: 3 MHz to 300 kHz, ±0.5 dB; 3 MHz to 1 kHz, ±1.0 dB[2].

Calibrated display range

Log — expanded from reference level down:
70 dB with 10 dB/Div scale factor
40 dB with 5 dB/Div scale factor
16 dB with 2 dB/Div scale factor
8 dB with 1 dB/Div scale factor

Linear. Full scale from 56 μV (–102 dBm across 50 ohms to 707 volts (+70 dBm)[1] in 10 dB steps and continuous 0 to –12 dB vernier. Full scale signals in linear translate to approximately full scale signals in the log modes.

Display accuracy
Log: < ±0.1 dB/dB but not more than ±1.5 dB over full 70 dB display range.
Linear: < ±0.1 division over full 8 division deflection

Residual responses (no signal present at input):
With 0 dB input attenuation on fundamental mixing (0.01 to 4.1 GHz) < –90 dBm.
Signal Identifier: Provided on all Frequency Bands in 1 MHz/Div frequency span for signal identification (reads incorrectly for 100 MHz Cal Output signal)

SWEEP SPECIFICATIONS

SWEEP TIME

Auto: Sweep time is automatically controlled by Frequency Span/Div, Resolution Bandwidth and Video Filter controls to maintain an absolute amplitude calibrated display.

Calibrated Sweep times: 21 internal sweep times from 2 μsec/Div to 10 sec/Div in 1, 2, 5, 10 sequence. Sweep time accuracy ±10% except for 2, 5, and 10 sec/Div which are ±20%. Swept frequency modes use sweep times 2 msec/Div through 10 sec/Div. When operated as a fixed tuned receiver (Zero Span) the full range of sweep times (2 μsec to 10 sec/Div) may be used to display modulation waveforms.

GENERAL SPECIFICATIONS

TEMPERATURE RANGE:
Operating 0°C to 55°C, storage –40° to +75°C.

HUMIDITY RANGE (Operating):
< 95% R.H. 0°C to 40°C.

EMI:
Conducted and radiated interference is within the requirements of methods CE03 and RE02 of MIL STD 461A, VDE 0871 and CISPR pub'n 1, 2, and 4.

POWER REQUIREMENTS
48-66 Hz, 100, 120, 200 or 240 volts (–10% to +5%) 220 VA maximum . Fan cooled.

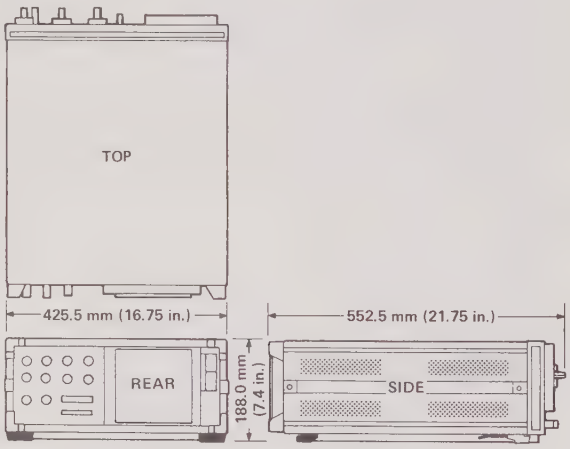
1 Input level not to exceet + 30 dBm damage level.
2 100 kHz BW limited to 90% relative humidity.

Table 1-1. Model 8565A Specifications (3 of 3)

CONVERSION LOSS OF EXT MIXER
AT 27 GHz IS 40 DB
37 GHz IS 48 DB

DIMENSIONS

426 mm wide: 188 mm high, 552 mm deep (16 3/4 in. x 7 3/8 in. x 21 3/4 in.)



WEIGHT: 30.4 kg (60 lbs.)

11517A EXTERNAL MIXER

When used with the 8565A for operation in waveguide 14.5 to 40 GHz:

MEASUREMENT RANGE

Maximum waveguide input: Saturation (gain compression < 1 dB), −15 dBm; Damage Level > 0 dBm or 0.1 erg.

Sensitivity:
(Average noise level in a 10 kHz IF bandwidth)
14.5-18 GHz < −80 dBm
18-26.5 GHz < −70 dBm
26.5-40 GHz < −60 dBm
Typical sensitivity is 10 dB better for each band.

STANDARD OPTIONS AVAILABLE

OPTION 100, 100 Hz RESOLUTION

Adds .3 kHz and .1 kHz resolution BW settings.
All specifications identical to standard 8565A except:

Spectral Resolution and Stability
Resolution Bandwidths: Resolution (3 dB) bandwidths from 100 Hz to 3 MHz in a 1, 3, 10 sequence.

Selectivity: (60 dB/3 dB bandwidth ratio) <15:1 for bandwidths 3 kHz to 3 MHz; <11:1 for bandwidths .1, .3, and 1 kHz.

Stability
Total Residual FM
Stabilized: <100 Hz p-p in 0.1 sec .01–8.5 GHz
Unstabilized: <10 kHz p-p in 0.1 sec .01 – 4.1 GHz (fundamental mixing)

OPTION 200, CALIBRATION IN dBμV

Front panel controls read in dBm as in standard instrument.

All specifications identical to standard 8565A except:
Bezel readout (top line, Reference Level): Reference level displayed in dBμV given in 1 dB increments from +177 dBμV[1] to +5 dBμV.

Average noise level (with 1 kHz IF bandwidth):

Band (GHz)	Max. Avg. Noise Level (dBμV)
0.01 to 1.8 GHz	−3
1.7 to 4.1	+1
3.8 to 8.5	+5
5.8 to 12.9	+15
8.5 to 18	+24
10.5 to 22	+35

Log Reference Level range: +177 dBμV[1] to +5 dBμV in 10 dB steps and continuous 0 to −12 dB calibrated vernier.

Calibrator Output: Amplitude +97 dBμV ± 0.3 dB.

OPTION 400, 400 Hz POWER SUPPLY

Permits operation on 50, 60, or 400 Hz mains.

All specifications identical to standard 8565A except:

GENERAL SPECIFICATIONS

Temperature range (operating): 50-60 Hz 0° to 40° C
400 Hz 0° to 55° C

Power requirements: 50, 60, or 400 Hz; 100, 120, 200, or 240 volts (−10% to +5%) 220 VA, maximum. Fan cooled.

[1]Input level not to exceed +137 dBμV damage level.

Table 1-2. Model 8565A Supplemental Characteristics (1 of 4)

SUPPLEMENTAL CHARACTERISTICS

NOTE: Values in this table are not specifications but are typical characteristics included for user information.

FREQUENCY CHARACTERISTICS

FREQUENCY SPANS

1.7 to 22 GHz

When this mode is selected the analyzer displays the entire spectrum from 1.7 to 22 GHz. A 3 MHz Resolution Bandwidth, 9 kHz Video Filter, and 100 msec/div Sweep Time are automatically selected.

Full Band

When selected by panel pushbutton, analyzer displays spectrum of Frequency Band chosen. This automatically selects a 3 MHz Resolution Bandwidth and a 9 kHz Video Filter. Sweep Time/Div varies from approximately 10 msec to 100 msec/div depending on which Frequency Band is chosen. Tuning marker frequency (position) indicates where analyzer tuning will be centered if a Per Division span mode is chosen.

Per Division

In "F" position (full band), the entire range of the Frequency Band selected is spanned, thus allowing the use of Resolution Bandwidth and Video Filter settings other than those chosen when the Full Band push button is depressed. Center frequency of the analyzer's display is set by the tuning control and indicated by the LED readouts. The Frequency CAL control to the right of the display window on the front panel is used to set the LED readout to agree with the actual center frequency of the CRT display (normally set using the 100 MHz CAL OUTPUT as a 0.100 GHz frequency reference).

Out-of-range blanking

The out-of-range portion of the CRT trace is automatically blanked whenever the analyzer is swept beyond a band edge.

RESOLUTION

Bandwidth Ranges

See Figure 1 for curves of typical analyzer resolution using different IF bandwidths.

IF Bandwidth shape: *Approximately gaussian (synchronously tuned, 4-pole filter)*

Frequency drift (fundamental mixing, .01-4.1 GHz) long term

At fixed center frequency after 2 hours warm-up:

Stabilized $< \pm 3.0$ *kHz/10 minutes*

Unstabilized $< \pm 25$ *kHz/10 minutes*

With Temperature Changes

Stabilized < 10 *kHz/°C*

Unstabilized < 200 *kHz/°C*

Auto stabilizer may be disabled in narrow spans (<100 kHz/Div) by depressing front panel pushbutton switch to "OFF" position.

VIDEO FILTER

Video Filter bandwidths typically ±20% of nominal value.

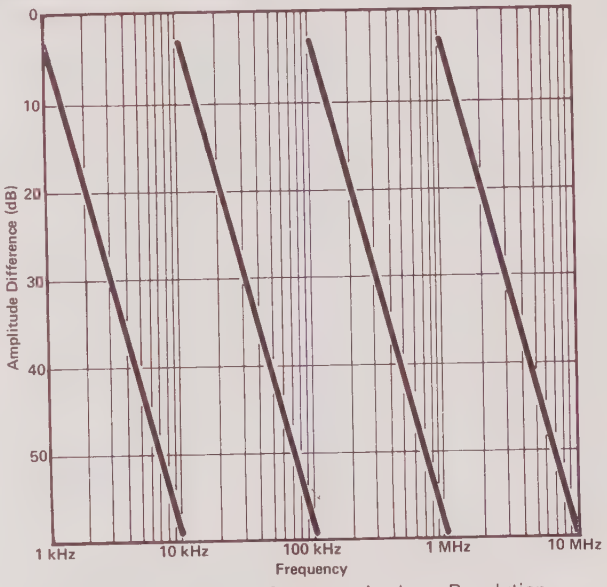


FIGURE 1. Typical Spectrum Analyzer Resolution

INTERNAL PRESELECTOR

Frequency Range	Description	Rejection
0.01 to 1.8 GHz	Low-pass filter	> 50 dB above 2.05 GHz
1.7 to 22 GHz	Tracking YIG tuned filter	> 70 dB greater than 642.8 MHz from center of pass band 1.7 to 18GHz, > 60 dB from 18 to 22 GHz

TRACKING PRESELECTOR

Preselector skirt roll-off: *Characteristics of a three-pole filter (nominally 18 dB/octave), 3 dB bandwidth typically varies from 25 MHz (at 1.7 GHz) to 70 MHz (at 22 GHz).*

AMPLITUDE CHARACTERISTICS

DYNAMIC RANGE

Maximum power ratio of two signals simultaneously present at the input that may be measured within the limits of specified accuracy, sensitivity and distortion (i.e., spurious responses): 0.01 to 22 GHz > 70 dB.

Spurious responses: *(Input attenuator set to 0 dB)*

Second harmonic distortion

Frequency Range	Input Power	Relative Distortion
0.01-1.8 GHz	—40 dBm	—70 dB
1.7-22 GHz	0 dBm	—100 dB*
*May be below average noise level.		

Table 1-2. Model 8565A Supplemental Characteristics (2 of 4)

SUPPLEMENTAL CHARACTERISTICS

NOTE: Values in this table are not specifications but are typical characteristics included for user information.

Third order intermodulation

Frequency Range	For Two Input Signals With Input Power	Signal Sep.	Relative Distortion
0.01-22 GHz	−25 dBm	50 kHz	70 dB
1.7-12.9 GHz	0 dBm	70 MHz	100 dB*
1.7-22 GHz	0 dBm	100 MHz	100 dB*
*May be below average noise level.			

For typical harmonic and third order intermodulation distortion, see Figure 2.

Image and Multiple Responses:

Frequency	Image (out of band)	Multiple (in-band)
0.01-1.8 GHz	−50 dB	non-existent
1.7-18 GHz	−70 dB	−70 dB
18-22 GHz	−60 dB	−60 dB

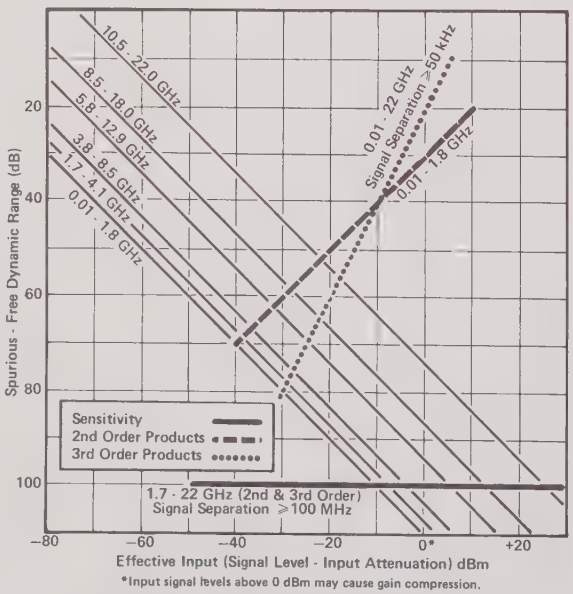


FIGURE 2. Optimum Dynamic Range Chart

AMPLITUDE ACCURACY

The overall amplitude accuracy of a measurement depends on an analyzer's performance and the measurement technique used. Applying IF substitution eliminates errors due to the display, bandwidth gain variation, scale factor and input attenuator step size. Only IF gain variation (reference level change with input attenuation constant: < ±1.0 dB), calibrator amplitude (< ±0.3 dB), and frequency response remain. In brief, IF substitution minimizes error by minimizing control changes from the reference measurement (e.g., calibration).

For measurements in the Frequency Bands covering 1.7 to 22 GHz that don't require the best possible accuracy, the front panel preselector peak may be left centered in its "green" setting. This adds typically < ±1.0 dB of error to the reference level value at room temperature.

Input Attenuator (at preselector input, 70 dB range in 10 dB steps)

Step size variation: <±1.0 dB .01 to 18 GHz
<±1.5 dB .01 to 22 GHz

Maximum cumulative error over the 0 to 70 dB range:
<±2.1 dB .01 to 12.4 GHz
<±2.4 dB .01 to 18 GHz
<±4.0 dB .01 to 22 GHz

Reference Level Variation (For any change of scale factor): *< ±1 dB.*

FREQUENCY RESPONSE AND SENSITIVITY

For typical frequency response and sensitivity versus input frequency, see Figure 3.

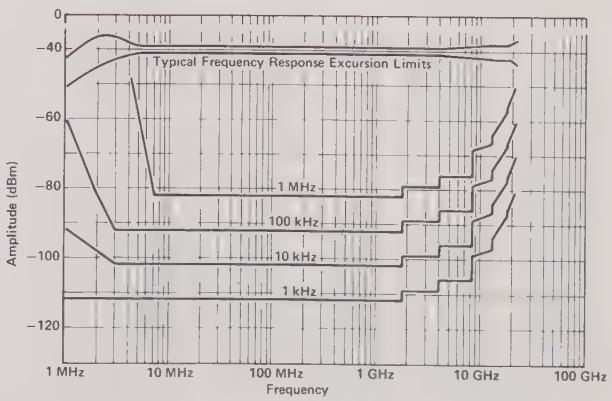


FIGURE 3. Average Noise Level vs. Input Frequency

Table 1-2. Model 8565A Supplemental Characteristics (3 of 4)

SUPPLEMENTAL CHARACTERISTICS

NOTE: Values in this table are not specifications but are typical characteristics included for user information.

SIGNAL INPUT CHARACTERISTICS

INPUT 50Ω 0.01 TO 22 GHz

Input connector: *Precision Type N female*

Input impedance

Input attenuator at 0 dB: *50 ohms nominal*

SWR: *<1.5 0.01 to 1.8 GHz*
<2.0 1.7 to 22 GHz (at analyzer tuned frequency)

Input attenuator at 10 dB or more: *50 ohms nominal*

SWR: *<1.3 0.01 to 1.8 GHz*
<2.0 1.7 to 22 GHz

LO Emission (2.00 to 4.46 GHz):
−50 dBm 0.01 to 1.8 GHz
−85 dBm 1.7 to 22 GHz

Input Protection (For input signals from .01 to 22 GHz)
0.01 to 1.8 GHz Frequency Band: *Internal diode limiter.*
1.7 to 22 GHz Frequency Bands: *Saturation of YIG filter (preselector) occurs at total input signal power levels below input mixer damage.*

EXTERNAL MIXER INPUT

BNC female connector is a port for LO power transfer, bias current and IF return.

SWEEP CHARACTERISTICS

SWEEP SOURCE

Manual: *Sweep determined by front panel control; continuously settable across CRT in either direction.*

External: *Sweep determined by 0 to + 10V external signal applied to External Sweep Input on rear panel. Blanking is controlled by signal at Blanking Input.*

Internal: *Sweep generated from internal sweep generator.*

SWEEP TRIGGER

Free Run: *Sweep triggered repetitively by internal source.*

Line: *Sweep triggered by power line frequency.*

Video: *Sweep internally triggered by detected waveform of input signal (signal amplitude of 0.5 division peak-to-peak required on CRT display).*

Trigger Level: *Functions in the Video and Ext Trigger modes to set the level of the displayed trace or Ext Trigger Input which will trigger the sweep.*

External Trigger: *Sweep triggering determined by signal input (between +1 and +10 volts) to rear panel BNC connector.*

Single: *Sweep triggered or reset by front panel Start/Reset button.*

Start/reset: *Also can reset any internal sweep to left edge of display.*

REAR PANEL INPUT AND OUTPUT CHARACTERISTICS

X,Y, and Z Axis Outputs: These rear panel outputs are compatible with and may be used to drive all current HP XY recorders (using positive pencoils or TTL penlift input) and CRT monitors.

Horizontal Sweep Output (X axis): *A voltage proportional to the horizontal sweep of the CRT trace which ranges from −5 V for the left edge to +5 V for the right edge. Output impedance is 5kΩ.*

Vertical Output (Y axis): *Detected video output proportional to vertical deflection of the CRT trace. Output increases 100 mV/div from 0 to 800 mV (from a 50Ω source) for a full 8 division deflection. Output impedance is 50Ω.*

Blank (Penlift or Z axis) Output: *A blanking output, 15 V from 10 kΩ, which occurs during CRT retrace or when sweeping beyond band edges. Otherwise output is low at 0V with a 10Ω output impedance for a normal or unblanked trace (pen down).*

Blanking Input: *Permits remote Z axis control of CRT with TTL Levels; normal <0.5V or open circuit, blanked >2V.*

10 kΩ input impedance.

Caution: *maximum input ± 40V.*

External Sweep Input: *When the front panel Sweep Source switch is set to the EXT mode, a 0 to 10V ramp will sweep the analyzer through the frequency range determined by front panel Tuning and Frequency Span/Div controls. 100 kΩ input impedance.* ***Caution:*** *maximum input ±40 V.*

External Trigger Input: *With the Sweep Trigger in EXT mode, a signal will trigger a sweep on the signal's positive slope between +1 and +10 volts according to the setting of the Trigger Level control. 100 kΩ input impedance, dc coupled.*
Caution: *maximum input ±40V.*

21.4 MHz IF Output: *A 50 ohm, 21.4 MHz output linearly related to the RF input to the analyzer. Bandwidth controlled by the analyzer's Resolution Bandwidth setting; amplitude controlled by the Input Attenuator, IF gain vernier and first 6 IF Reference Level step gain positions (0 through −50 dBm level with 0 dB input attenuation). Output is approximately −10 dBm from 50Ω for full scale signals on the CRT.*

First LO Output: *Terminate in a 50Ω load when not in use.*

Frequency: *2.00 to 4.46 GHz*
Power Level: *typically at +8 dBm*
Stability (Typical residual FM):
Stabilized: 30 Hz P-P
Unstabilized: 2 kHz P-P

Aux A: *Interconnection for use with 8750A normalizer.*

Aux B: *Used during factory calibration.*

Table 1-2. Model 8565A Supplemental Characteristics (4 of 4)

SUPPLEMENTAL CHARACTERISTICS

NOTE: **Values in this Table are not specifications but are typical characteristics included for user information.**

DISPLAY CHARACTERISTICS

CATHODE RAY TUBE

Type: *Post deflection accelerator, approximately 8.5 kV accelerating potential, aluminized P31 phosphor, electrostatic focus and deflection.*

Graticule: *8 x 10 division internal graticule, 1 division equals 0.90 cm (0.35 inches) with 5 subdivisions per major division.*

Persistence

Conventional: *Natural persistence of P31 phosphor (approximately 40 μsec).*

Write: *Continuously adjustable from 0.2 sec to full storage.*

Storage time: *> 1 minute at full brightness in Write mode extending to > 30 minutes in Store mode at lower brightness. Storage time (Store Intensity) in Store mode is continuously adjustable from 1 minute (full brightness) to >30 minutes (minimum brightness).*

Baseline Clipper: *Adjusts the vertical level below which the CRT is blanked. Helps prevent blooming by blanking the bright baseline area on the CRT. Eases analysis of pulsed RF and transient signals.*

Scale: *Turns on internal scale illumination for photography after erasing CRT. Frequency readout is frozen.*

Scale Intensity: *Adjusts scale illumination.*

CRT BEZEL READOUT

Light emitting diodes in the bezel display the following measurement data: (included in CRT photographs taken with the HP 197A Option 006 Oscilloscope Camera).

Top Line

Amplitude Scale: *Indicates the vertical scale factor chosen; linear (LIN), 10, 5, 2, or 1 dB/div.*

Reference Level: *Given in 1 dB increments from +70 dBm[1] to —102 dBm.*

Input Attenuation

Resolution Bandwidth

Bottom line

Sweep Time/Div: *A for Auto otherwise sweep times given in sec, msec, or μsec per division.*

Frequency: *Marker frequency displayed in 1.7-22 GHz and full band modes. Center frequency displayed for Per Div and Zero Span modes.*

Freq Span/Div: *F Hz for full band spans and 1.7-22 span, or horizontal calibration in MHz or kHz per division.*

[1] Maximum RF Input + 30 dBm.

1-12. Safety Symbols

Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Indicates dangerous voltages.

Earth terminal

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

1-13. Service

1-14. Although this instrument has been manufactured in accordance with international safety standards, this manual contains information, cautions, and warnings which must be followed to insure safe operation and to keep the instrument safe. Service should be performed only by qualified service personnel, and the following warnings should be observed:

WARNINGS

Any maintenance or repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

When it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earthed pole of the power source.

BEFORE SWITCHING ON THE INSTRUMENT, the protective earth terminals of the instrument must be connected to the protective conductor of the mains power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cord) without a protective conductor (grounding). Grounding one conductor of a two conductor outlet is not sufficient protection.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal is likely to make this instrument dangerous.

CAUTIONS

BEFORE SWITCHING ON THIS INSTRUMENT, make sure instrument's ac input is set to the voltage of the ac power source (see Figure 2-1).

BEFORE SWITCHING ON THIS INSTRUMENT, make sure the ac line fuse is of the required current rating and type (normal-blow, time delay, etc.).

1-15. INSTRUMENTS COVERED BY MANUAL

1-16. Attached to the instrument is a serial number plate (Figure 1-2). The serial number is in two parts. The first four digits and the letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

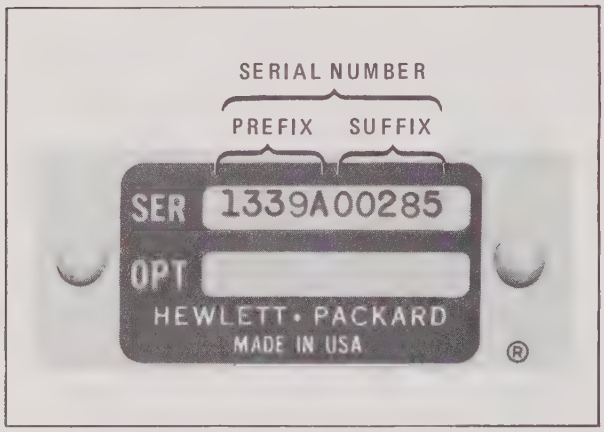


Figure 1-2. Typical Serial Number Plate

1-17. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

1-18. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as curent as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with this manual's print date and part number, both of which appear on the manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-19. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-20. DESCRIPTION

1-21. The HP Model 8565A Spectrum Analyzer provides a visual display of RF signals in the frequency domain. Input signal amplitude is plotted on the CRT as a function of frequency.

1-22. The HP Model 8565A is designed for simplicity of operation. Most measurements can be made using only three controls once the green Normal Settings have been preset. The Model 8565A has absolute amplitude and frequency calibration from 10 MHz to 22 GHz. The frequency span, bandwidth, and video filter are all coupled with automatic sweep time to maintain a calibrated display and simplify operation of the analyzer.

1-23 Internal preselection eliminates most spurious image and multiple responses to simplify signal identification. The preselector also extends dynamic range of the analyzer as well as provides some protection for the input mixer.

1-24. All major spectrum analyzer control settings are displayed on the CRT bezel readout. The frequency range of the HP Model 8565A is 10 MHz to 22 GHz in direct coaxial input and 14.5 to 40 GHz when used with the HP Model 11517A External Mixer.

1-25. OPTIONS

1-26. Option 100

1-27. The HP Model 8565A Option 100 provides RESOLUTION BW settings of .3 kHz and .1 kHz in addition to the standard 3 MHz to 1 kHz settings. These additional resolution bandwidths provide capability of measuring signals which are very close in frequency. The Option 100 also provides greater sensitivity then the standard Model 8565A. Average noise level in the 100 Hz bandwidth is typically 10 dB better than average noise level in the 1 kHz bandwidth.

1-28. Option 200

1-29. The HP Model 8565A Option 200 provides calibration in dBμV. Front panel controls read in dBm as in standard instrument but bezel readout displays Reference Level in dBμV. Reference Level is displayed in 1 dB increments from +177 dBμV to +5 dBμV.

1-30. Option 400

1-31. The HP Model 8565A Option 400 permits operation on 50, 60, or 400 Hz mains. All specifications are identical to standard Model 8565A except operating temperature range and power requirements (see Table 1-1).

1-32. Option 907 Front Handle Kit

1-33. Option 907, HP Part Number 5061-0090, contains front handles and necessary hardware for attaching the handles. See Figure 2-2 for installation procedure.

1-34. Option 908 Rack Flange Kit

1-35. Option 908, HP Part Number 5061-0078, contains flanges and hardware required to mount the 8565A in an equipment rack with 482, 6mm (19 inches) horizontal spacing. See Figure 2-2 for installation procedure.

1-36. Option 909 Rack Flange/Front Handle Kit

1-37. Option 909, HP Part Number 5061-0084, consists of one Option 907 Front Handle Kit and one Option 908 Rack Flange Kit (see descriptions above.) See Figure 2-2 for installation procedure.

1-38. Option 910 Additional Operating and Service Manuals

1-39. Option 910 provides additional Operaing and Service manual(s). The number of additional manuals depends on quantity of Option 910's ordered. To obtain additional Operating and Service manuals after initial shipment, order by manual part number (refer to title page or rear cover of manual).

1-40. ACCESSORIES SUPPLIED

1-41. Figure 1-1 shows the HP Model 8565A Spectrum Analyzer and line power cord. Two 50-ohm terminations (HP 11593A's) are also supplied. One termination is connected to the front-panel EXT MIXER port and the other is connected to the rear-panel 1st LO OUTPUT port.

1-42. EQUIPMENT AVAILABLE

1-43. Service Accessories

1-44. A Service Accessories Package is available for convenience in aligning and troubleshooting the specrum analyzer. The Service Accessories Package is shown in Figure 1-3. The package may be obtained from Hewlett-Packard by ordering HP Part Number 08565-60100.

1-45. Measurement Accessories

1-46. HP Model 11517A External Mixer. This mixer extends the frequency range coverage of the HP Model 8565A to 40 GHz. Transition sections (HP Model 11518, 11519A, and 11520A) are available to adapt the Model 11517A External Mixer to standard waveguide sizes.

1-47. HP Model 197A Option 006 Oscilloscope Camera. This camera can be used with the Model 8565A to make permanent records of your measurements. Photographs include the bezel readout information.

1-48. HP Model 8750A Storage-Normalizer. True long term storage and trace comparison make the Model 8750A a useful compliment to the HP Model 8565A's display.

CAUTION

Prolonged use of 8565A in CONVentional mode with 8750A Storage-Normalizer is not recommended; may cause changes in 8565A display storage characteristics (WRITE mode).

1-49. HP Model K01-8565A Transit Case. This case protects the 8565A and provides a storage compartment for cables and reference booklets.

1-50. RECOMMENDED TEST EQUIPMENT

1-51. Equipment required for incoming inspection, performance testing and troubleshooting of the Hewlett-Packard Model 8565A is listed in Table 1-3. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

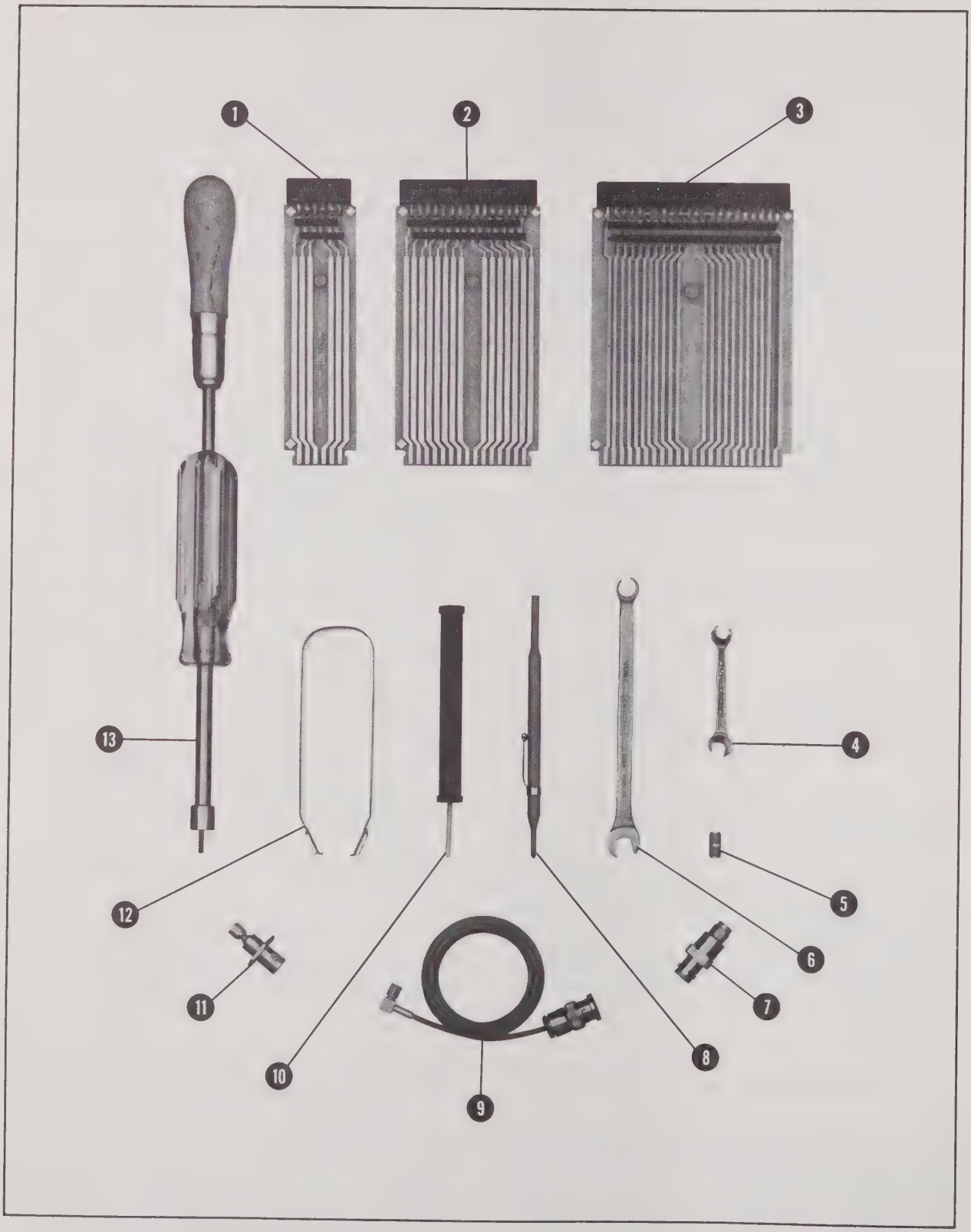


Figure 1-3. Service Accessories, HP Part Number 08565-60100 (1 of 2)

Item	Description	HP Part Number
1	Extender board, 6 pin (12 conductors)	08505-60109
2	Extender board, 15 pin (30 conductors)	08505-60041
3	Extender board, 22 pin (44 conductors)	08565-60107
4	Wrench, 15/64 inch open end	8710-0946
5	Adapter, SMA male to male	1250-1158
6	Wrench, 5/16 inch slotted box end/open end	08555-20097
7	Adapter, BNC female to SMA male	1250-1200
8	Alignment tool	8710-0630
9	Test cable, subminiature (SMC) female to BNC male (36 inches long)	11592-60001
10	Alignment tool, non-metalic	8710-0033
11	Adapter, BNC female to SMC female (used to measure second LO output)	08565-60087
12	Connector extractor	8710-0580
13	Tuning tool (consists of modified 5/16 inch nut driver with modified No. 10 Allen driver)	08555-60107

Figure 1-3. Service Accessories, HP Part Number 08565-60100 (2 of 2)

Table 1-3. Recommended Test Equipment (1 of 3)

Instrument	Critical Specifications	Recommended Model	Use*
Digital Multimeter	Range: −1000V to +1000V Accuracy: ±0.004% of reading plus 0.001% of range. Input impedance: 10 Meg ohms	HP 3490A	P,A,T
Oscilloscope	Frequency: 100 MHz Sensitivity: 5mV/Div	HP 1740A	A,T
Probe	High Voltage - 4KV	HP 34111A	A,T
Probe	10:1 Divider	HP 10004D	A,T
Probe	1:1 Divider	HP 10007D	A,T
Function Generator	Amplitude: 0 to +10V p-p sine wave with dc offset. Frequency: 1 to 5 kHz	HP 3312A	P,A,T
Pulse Generator	Transition time: 20 ns Pulse Width: 30 ns Pulse Repetition Rate: 100μs Amplitude: +4V p-p	HP 8002A	A
Signal Generator	Frequency: 50 to 500 MHz Modulation Frequency: 100 kHz Modulation Deviation: 1% of lowest frequency in range.	HP 8460B, Opt. 001	P,A,T
Time Mark Generator	Range: 5 ns to 10 sec Output: +1V peak; 50 Ohm Accuracy: ±0.005%	HP 226A	P, A
Frequency Counter	Range: .01 to 23 GHz (0.1 to 18 GHz for Incoming Inspection)	HP 5340A, Opt. H10	P,A,T,I
Comb Generator	Frequency Markers: 10 and 100 MHz Increments up to 5 GHz	HP 8406A	P,A,I
Power Meter	Range: −20 to +10 dBm (usable with waveguide thermistor mount)	HP 432A	P,A,T
Power Meter	Range: −20 to +10 dBm Accuracy: ±1.2% worst case	HP 435A	P,A,I
Thermistor Mount	Frequency Range: .01 to 18 GHz	HP 8478B	P,A,T
Thermistor Mount	Frequency Range: 18 to 22 GHz	HP K486A	P,A
Power Sensor	Frequency Range: .03 to 18 GHz	HP 8481A	P,A,I
Spectrum Analyzer	Frequency: 300 MHz	HP 140T/8552B 8555A	A,T
Sweep Oscillator	Mainframe for RF Plug-In	HP 8620C	P,A,T,I

Table 1-3. Recommended Test Equipment (2 of 3)

Instrument	Critical Specifications	Recommended Model	Use*
RF Plug-In	Frequency: 2 to 22 GHz (2 to 18 GHz for Incoming Inspection) Residual FM: <30 kHz in 10 kHz Bandwidth	HP 86290A, Opt. H08	P,A,T,I
RF Plug-In	Frequency: .01 to 2.4 GHz	HP 86222A	P,A
Sweep Oscillator***	Mainframe for RF Plug-In	HP 8690B	P,A
RF Plug-In***	Frequency: 18 to 22 GHz	HP 8696A	P,A
Synchronizer	No Substitute	HP 8709A, Opt. H10	A
Power Splitter	Frequency: 2 to 18 GHz Attenuation: 6 dB each arm Connectors: Type N Female Input APC-7 Outputs	HP 11667A, Opt. 002	P, A
Crystal Detector	Frequency: .1 to 22 GHz Input Connector: APC-3.5	HP 33330C	P,A,T
Mixer	Input Frequency: 23 GHz	HP 11517A	P
Adapter	K-Band to R-Band; for use with HP 11517A Mixer	HP 11519A	P
Directional Coupler***	Frequency: 18 to 22 GHz Nominal Coupling: 10 dB	HP K752C	P
Step Attenuator	Attenuation: 0 to 12 dB in 1 dB steps Frequency: 100 MHz, Calibrated	HP 355C, Opt. H80	P, A
Step Attenuator	Attenuation: 0 to 120 dB in 10 dB steps Frequency: 100 MHz, Calibrated	HP 355D, Opt. H80	P, A
Attenuator	Attenuation: 10 dB ±0.5 dB Frequency: .01 to 18 GHz Connectors: Type N	HP 8491B, Opt. 010	P, A
Attenuator	Attenuation: 10 dB ±0.5 dB Frequency: .01 to 18 GHz Connectors: APC-7	HP 8492A, Opt. 010	P
Termination	Frequency: dc to 18 GHz Impedance: 50 Ohms Connector: Type N Male	HP 909A, Opt. 012	P
Adapter**	BNC Female to SMC Female	HP 08565-60087	A,T
Adapter (2 required)****	Waveguide to SMA Jack	Narda 4608	P, A

Table 1-3. Recommended Test Equipment (3 of 3)

Instrument	Critical Specifications	Recommended Model	Use*
Adapter	APC-7 to Type N Male	HP 11525A	P, A
Adapter	APC-7 to SMA Female	HP 11534A	P, A
Adapter	APC-7 to Type N Female	HP 11524A	P, A
Adpater	Type N Female to SMA Female	HP 08690-60005	P, T
Adapter	Type N Plug to SMA Jack	HP 1250-1250	P, T
Adapter (2 required)	Type N Male to BNC Female	HP 1250-0780	P, T
Adapter	Type N Female to BNC Male	HP 1250-0077	P
BNC Tee	Connectors: BNC Jack and Plug	HP 1250-0781	A
BNC Short	Impedance: 50 Ohms	HP 1250-0774	A
Cable Assembly	SMA Plug both ends	HP 8120-1578	P, T
Cable Assembly	Type N Connector both ends	HP 11500A	P, T
Test Cable**	SMA Female to BNC Male	HP 11592-60001	P

* P = Performance Test; A = Adjustments; T = Troubleshooting; I = Incoming Inspection
** These parts are included in Service Package; HP Part Number 08565-60100.
*** Not required if HP 86290A, Opt. H08 used.
**** Only one required if HP 86290A, Opt. H08 used.

SECTION II
INSTALLATION
INCOMING INSPECTION

2-1. INTRODUCTION

2-2. This section includes information on the initial inspection, preparation for use, storage/shipment instructions, and incoming inspection for the HP Model 8565A.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. The Model 8565A requires a power source of 100, 120, 220, or 240 Vac +5% −10%, 48-66 Hz. Power consumption is less than 220 volt-amperes. The Model 8565A Option 400 permits operation on 50, 60, or 400 Hz mains at voltages specified above.

2-8. Line Voltage and Fuse Selection

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, its protective earth terminals must be connected to the protective conductor of the mains power cable (cord). The mains power cable plug shall only be inserted in a socket outlet provided with a protective earth contact. DO NOT negate the earth-grounding protection by using an extension cable, power cable, or autotransformer without a protective ground conductor. Failure to ground the instrument properly can result in personal injury.

CAUTION

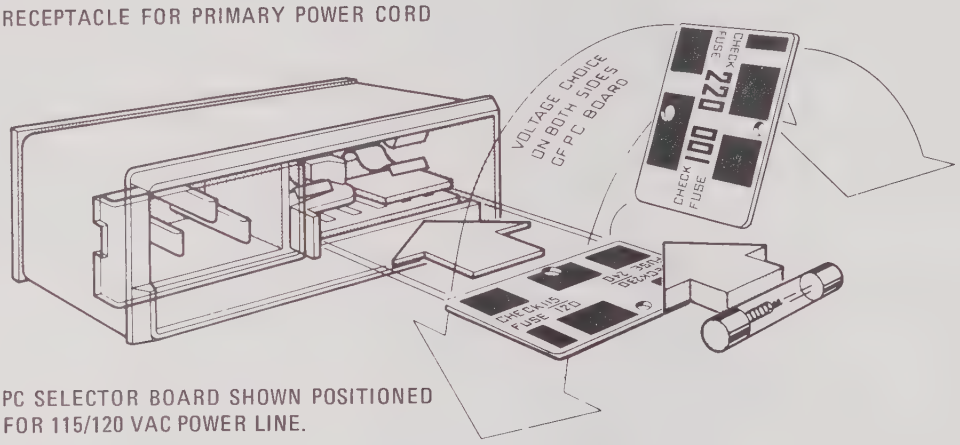
BEFORE SWITCHING ON THIS INSTRUMENT, make sure it is adapted to the voltage of the ac power source. You must set the voltage selector card correctly to adapt the 8565A to the power source. Failure to set the ac power input of the instrument for the correct voltage level could cause damage to the instrument when switched on.

2-9. Select the line voltage and fuse as follows:

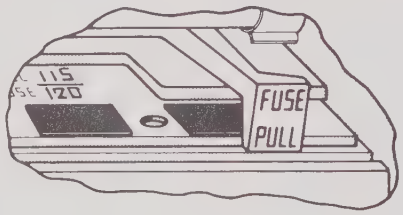
a. Measure the ac line voltage.

b. Refer to Figure 2-1. At the instrument's rear panel power line module, select the line voltage (100V, 120V, 220V, 240V) closest to the voltage you measured in step a. Line voltage must be within +5% or −10% of the voltage setting. If it is not, you must use an autotransformer between the ac source and the 8565A.

c. Make sure the correct fuse is installed in the fuse holder. The required fuse rating for each line voltage selection is indicated below the power line module.



OPERATING VOLTAGE APPEARS IN MODULE WINDOW.



SELECTION OF OPERATING VOLTAGE

1. SLIDE OPEN POWER MODULE COVER DOOR AND PUSH FUSE-PULL LEVER TO LEFT TO REMOVE FUSE.
2. PULL OUT VOLTAGE-SELECTOR PC BOARD. POSITION PC BOARD SO THAT VOLTAGE NEAREST ACTUAL LINE VOLTAGE LEVEL IS ON TOP-LEFT SIDE OF BOARD. PUSH BOARD BACK INTO ITS SLOT.
3. PUSH FUSE-PULL LEVER INTO ITS NORMAL RIGHT-HAND POSITION.
4. CHECK FUSE TO MAKE SURE IT IS OF CORRECT RATING AND TYPE FOR INPUT AC LINE VOLTAGE. FUSE RATINGS FOR DIFFERENT LINE VOLTAGES ARE INDICATED BELOW POWER MODULE.
5. INSERT CORRECT FUSE IN FUSEHOLDER.

Figure 2-1. Line Voltage Selection with Power Module PC Board

2-10. Cable Connections

2-11. Power Cable. In accordance with international safety standards this instrument is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Table 2-2 shows the styles of mains plugs available on power cables supplied with the HP instruments. The numbers for the plugs are part numbers for complete power cables.

WARNING

If this instrument is to be energized through an autotransformer, make sure the common terminal of the auto transformer is connected to the protective earth contact of the power source outlet socket.

Any interruption of the protective ground, inside or outside of the 8565A can make this instrument a shock hazard.

2-12. Mating Connectors

2-13. A list of connectors on the front and rear panels of the Model 8565A is given in Table 2-1. An industry identification, HP part number, and alternate source for the mating connector is given for each connector on the instrument.

2-14. Operating Environment

2-15. Temperature. The instrument may be operated in temperatures from 0°C to +55°C.

2-16. Humidity. The instrument may be operated in environments with humidity from 5% to 95% at 0° to 40°C. However, the instrument should also be protected from temperature extremes which cause condensation within the instrument.

2-17. Altitude. The instrument may be operated at altitudes up to 4572 metres (15000 feet).

2-18. Bench Operation

2-19. The instrument cabinet has plastic feet and foldaway tilt stands for convenience in bench operation. The tilt stands raise the front of the instrument for easier viewing of the control panel. The Plastic feet are shaped to make full width modular instruments self-aligning when stacked.

2-20. Rack Mounting (Option 908/909)

2-21. Instruments with Option 908 contain Rack Flange Kit. This kit supplies necessary hardware and installation instructions for preparing the instrument to be mounted on a rack of 482,6 mm (19 inch) spacing. Installation instructions are also given in Figure 2-2. See Table 2-3 for HP Part Numbers.

2-22. Instruments with Option 909 contain Rack Flange Front Handle Kit. This kit supplies necessary hardware and installation instructions for preparing instrument, with the addition of front handles, to be mounted on a

Table 2-1. Model 8565A Mating Connectors

Connector on Instrument	Mating Connector		
	Industry Identification	HP Part No.	Alternate Source
J11 INPUT 50Ω	Type N, male connector, UG-21G/U	1250-0882	Specialty Connector 25 P117-2
J12, J13 and J3 thru J10	Type BNC, male connector UG-88/U	1250-0256	Specialty Connector 28 P118-1
J1 AUX A	Series D, 24 contact, male connector	1251-2204	TRW Cinch Div. DDM-24W7P
J2 AUX B	Series D, 17 contact, male connector	1251-1285	TRW Cinch Div. DCMF-17W5P

Table 2-2. AC Power Cables Available

Plug Type	HP Part Number	Plug Description	Cable Length (inches)	Cable Color	For Use In Country
	8120-1351 8120-1703	Straight 90°	90 90	Mint Gray Mint Gray	Great Britian Cyprus, Nigeria Rhodesia Singapore So. Africa, India
	8120-1369 8120-0696	Straight 90°	79 87	Gray Gray	Australia New Zealand
	8120-1689 8120-1692	Straight 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
	8120-1348 8120-1398 8120-1754	Straight 90° Straight	80 80 36	Black Black Black	United States Canada Japan (100 or 200V) Mexico Phillippines Taiwan
	8120-1378 8120-1521 8120-1676	Straight 90° Straight	80 80 36	Jade Gray Jade Gray Jade Gray	
	8120-2104	Straight	79	Gray	Switzerland

rack of 482,6 mm (19 inch) spacing. Installation instructions are also given in Figure 2-2. See Table 2-3 for HP Part Numbers.

2-23. Front Handles (Option 907)

2-24. Instruments with Option 907 contain front Handle Kit. This kit supplies necessary hardware and installation instructions for mounting front handles on the instrument.

2-25. STORAGE AND SHIPMENT

2-26. Environment

2-27. The instrument may be stored or shipped in environments within the following limits:

Temperature . . . . . −40°C to +75°C
Humidity . . . . . 5% to 95% at 0° to 40°C
Altitude . . . . . Up to 15240 metres (50000 feet)

The instrument should also be protected from temperature extremes which cause condensation within the instrument.

2-28. Packaging

2-29. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-30. Other Packaging. The following general instructions should be used for repackaging with commercially available materials.

a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 275 pound bursting strength corrugated single-wall box is sufficient.

c. Use enough shock-absorbing material (3 to 4 inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.

Table 2-3. Rack-Mounting Kits for 8565A

Description	HP Part Number	Quantity
OPTION 908		
Rack Flange	5020-8863	2
Machine Screw, Pan Head, 8-32 x 0.375 inch	2510-0193	8
OPTION 909		
Handle Assembly	5060-9900	2
Rack Flange	5020-8875	2
Machine Screw, Pan Head, 8-32 x 0.625 inch	2510-0194	8

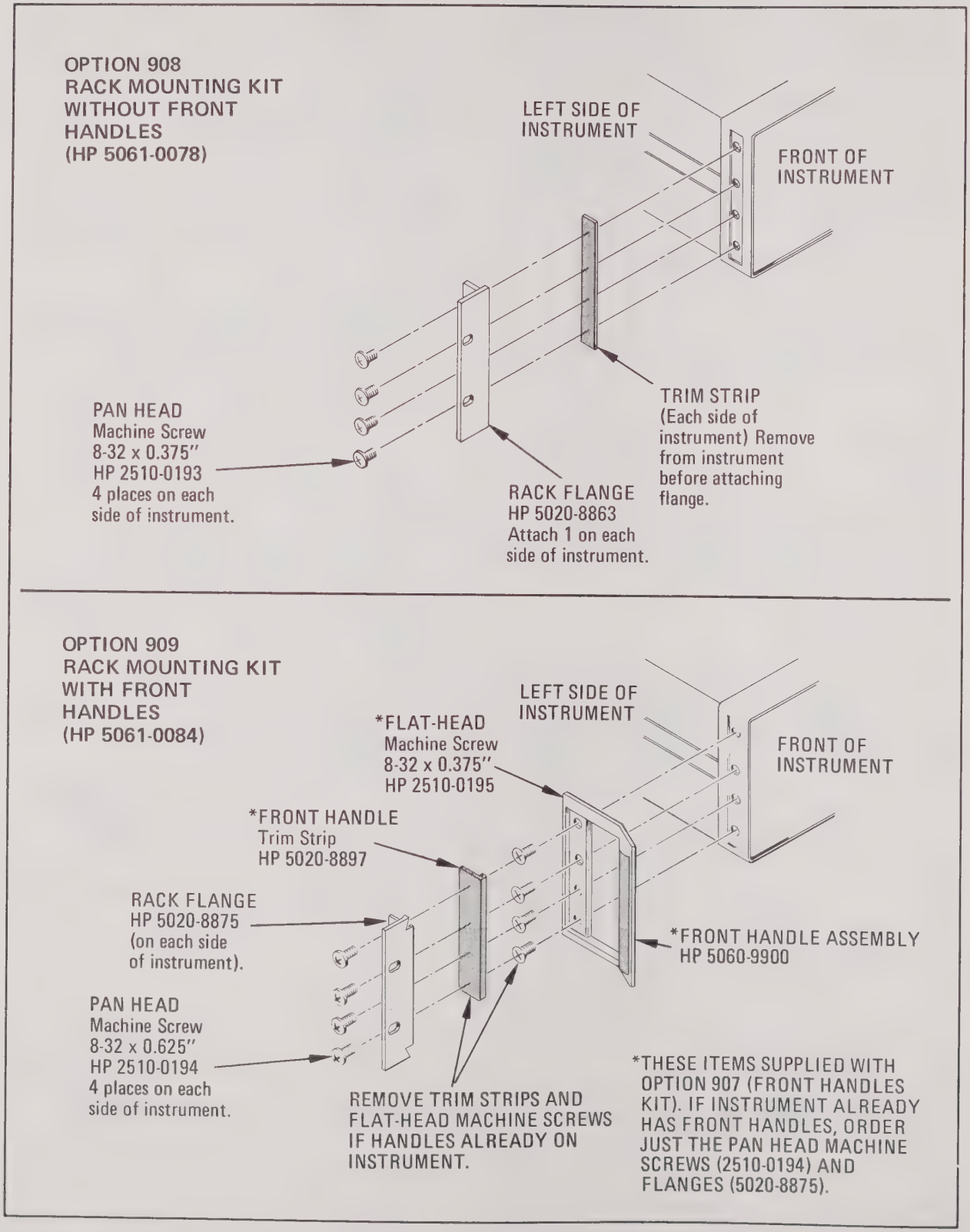


Figure 2-2. Attaching Rack Mounting Hardware and Handles

2-31. INCOMING INSPECTION TESTS

2-32. These tests are designed to meet the needs of incoming inspection. The procedures test only the critical specifications of the HP Model 8565A Spectrum Analyzer. Equipment required to perform the incoming inspection is listed in Table 1-3. If substitution is necessary for any of the equipment, the alternate models must meet or exceed the critical specifications listed in Table 1-3.

2-33. The Incoming Inspection Tests require much less time and equipment than the complete Performance Tests in Section IV. The Incoming Inspection Tests may also be used for verification of overall instrument operation after repair.

INCOMING INSPECTION TESTS

NOTE

Allow at least 30 minutes warmup time.

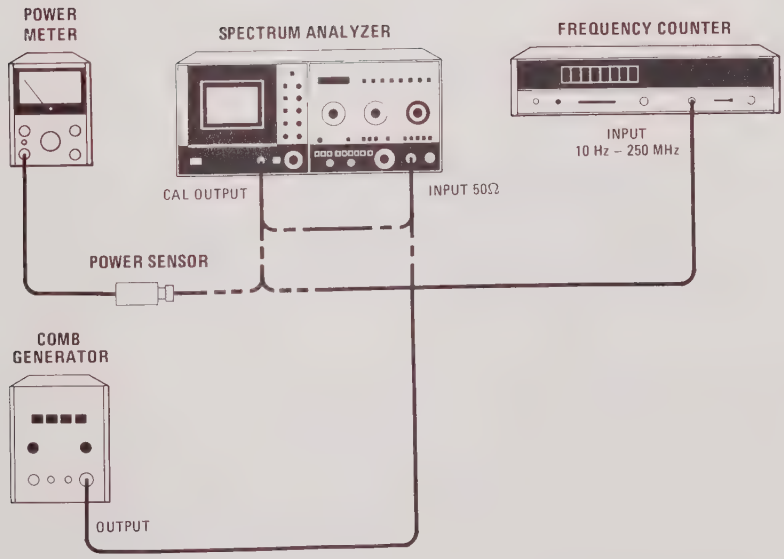


Figure 2-3. Incoming Inspection Test Setup

INCOMING INSPECTION TESTS

EQUIPMENT:

Frequency Counter	HP 5340A
Comb Generator	HP 8406A
Power Meter	HP 435A
Power Sensor	HP 8481A
Step Attenuator (10 dB/Step)	HP 355D

NOTE

If substitution is necessary for any of the above listed equipment, the alternate models must meet or exceed the critical specifications listed in Table 1-3.

2-34. OPERATIONAL FUNCTION CHECK

PROCEDURE:

a. Perform Front Panel Adjustment procedure listed on the pull-out card located under the 8565A.

b. Connect comb generator (100 MHz comb) to the 8565A INPUT 50Ω. Set all Normal Settings. Set FREQUENCY SPAN/DIV to 1 MHz and TUNING to .100 GHz. Set each function to the setting shown in Table 2-4 and verify indication is that noted in Table 2-4.

NOTE

Return to Normal Settings after each Function is checked.

INCOMING INSPECTION TESTS

Table 2-4. Operational Function Check (1 of 3)

Function	Setting	Indication
SWEEP SOURCE	MAN	Rotation of MANUAL SWEEP control varies position of trace on CRT display.
	EXT	No sweep. Bright dot on lower left edge of CRT display.
	INT	Sweep visible on CRT display.
SWEEP TRIGGER	FREE RUN	Sweep visible on CRT display.
	LINE	Sweep visible on CRT display.
	VIDEO	Presence of CRT sweep is dependent on TRIGGER LEVEL setting.
	EXT	No CRT trace is visible.
	SINGLE	One sweep is triggered when START/RESET push-button is pressed.
SWEEP TIME/DIV	Slowly rotate control counterclockwise.	Sweep on CRT display becomes increasingly slower.
BASELINE CLIPPER	Rotate clockwise	Baseline and lower portion of signal is blanked.
PRESELECTOR PEAK	**NOTE** **Select 1.7 – 4.1 FREQUENCY BAND GHz and adjust TUNING control to center signal on CRT display.**	
	Rotate over full range	Signal amplitude varies. (Set control for maximum signal amplitude.)
AUTO STABILIZER	**NOTE** **Set FREQUENCY SPAN/DIV to 100 kHz and adjust TUNING control to center signal on CRT display.**	
	OFF (depressed)	Tuning of signal with coarse TUNING control is continuous.
	ON (out)	Tuning of signal with coarse TUNING control causes signal to jump off CRT display.

INCOMING INSPECTION TESTS

Table 2-4. Operational Function Check (2 of 3)

Function	Setting	Indication
FREQUENCY SPAN MODE	**NOTE** **Set FREQUENCY SPAN/DIV to 100 MHz**	
	PER DIV	Signals are displayed at one division intervals.
	NOTE **Set FREQUENCY SPAN/DIV to .2 MHz and adjust TUNING control to center signal on CRT display.**	
	ZERO SPAN	CRT trace is a straight line and FINE TUNING control affects signal amplitude.
	FULL BAND	Twenty-five comb teeth are visible and baseline marker position is determined by coarse TUNING control.
	1.7–22 GHz SPAN	Baseline rises on CRT display from left to right in five steps (See Section III Figure 11).
AMPLITUDE SCALE (Center signal on CRT display.)	10 dB (LOG/DIV)	10 dB change in REF LEVEL changes signal amplitude by one division ±0.1 division.
	NOTE **Set REF LEVEL and REF LEVEL FINE to position signal peak 0.5 divisions below REFERENCE LEVEL graticule line. Center signal on CRT display with TUNING control.**	
	5 dB (LOG/DIV)	Signal peak one division below REFERENCE LEVEL graticule line (±0.25 division).
	2 dB (LOG/DIV)	Signal peak 2.5 divisions below REFERENCE LEVEL graticule line (±0.6 division).
	1 dB (LOG/DIV)	Signal peak 5 divisions below REFERENCE LEVEL graticule line (±1.2 divisions).
	LIN	Signal peak 3.5 divisions below REFERENCE LEVEL graticule line (±1.0 division).
Display Function	CONV	Conventional CRT trace. No variable persistance control.
	WRITE	CRT trace brightness adjusted by INTENSITY and trace fade rate adjusted by PERSIST.
	ERASE	When depressed, CRT trace is erased, background momentarily brightens, then CRT trace is again displayed.

Table 2-4. Operational Function Check (3 of 3)

Function	Setting	Indication
Display Function (Cont'd)	STORE	Stores trace on CRT display. Rotating STORE INTEN changes brightness and fade rate of stored trace.
	SCALE	CRT trace is erased and graticule is illuminated with uniform background brightness. Background brightness adjusted by SCALE INTEN control.
	NOTE **Set FREQUENCY SPAN/DIV to 1 MHz and center signal on CRT display with TUNING control.**	
SIG IDENT	Depressed	Two signals on CRT display. Signal identifier signal is two divisions to left of comb tooth and is also lower in amplitude.
Bezel Display		Bezel display shows actual settings of major front panel controls.
VIDEO FILTER	Step through each switch position (clockwise)	Each step decreases baseline noise level and decreases sweep speed. Sweep speed increases when switching to NOISE AVG position and CRT trace is a straight line.

2-35. TUNING ACCURACY TEST (INTERNAL MIXING)

SPECIFICATION:

0.01 to 2.5 GHz < ±5 MHz ±20% of Frequency Span/Div.

2.5 to 22 GHz < ±0.2% ±20% of Frequency Span/Div.

DESCRIPTION:

The tuning accuracy of the 8565A is verified in the first three FREQUENCY BAND GHz settings using a comb generator. The CAL OUTPUT frequency is measured and the 8565A is calibrated at 100 MHz. The comb generator is then connected to the 8565A INPUT 50Ω and tuning accuracy is checked.

PROCEDURE:

a. Connect frequency counter to spectrum analyzer CAL OUTPUT as shown in Figure 2-3. Set the controls as follows:

Set all Normal Settings (controls marked in green)
FREQUENCY BAND GHz ..... .01 — 1.8
TUNING ..... 0.100 GHz
INPUT ATTEN ..... 10 dB
REF LEVEL ..... −10 dBm
REF LEVEL FINE 0
FREQUENCY SPAN/DIV ..... 1 MHz
RESOLUTION BW ..... 30 kHz

INCOMING INSPECTION TESTS

2-35. TUNING ACCURACY TEST (INTERNAL MIXING) (Cont'd)

b. Measure the spectrum analyzer CAL OUTPUT frequency using the frequency counter. Reading should be 100 MHz ±0.01 MHz.

c. The calibration of the FREQUENCY GHz display is initially adjusted at 100 MHz. Connect CAL OUTPUT to INPUT 50Ω and tune 8565A to center the signal on the CRT display. If necessary, adjust FREQ CAL for a reading of 0.100 on FREQUENCY GHz display. Check that Bezel Display frequency also indicates 0.100 GHz.

d. The calibration of the FREQUENCY GHz display in the other FREQUENCY BANDs is verified as follows:

1. Tune 8565A for an indication of 1.800 GHz on FREQUENCY GHz digital readout.

2. Connect comb generator to spectrum analyzer INPUT 50Ω and tune 8565A to center 1.8 GHz comb tooth on CRT display. FREQUENCY GHz digital readout must be 1.800 GHz ±0.005 GHz.

3. Select 1.7 — 4.1 FREQUENCY BAND GHz and set TUNING control for an indication of 3.000 GHz on FREQUENCY GHz digital readout.

4. Center 3 GHz comb tooth on CRT display. FREQUENCY GHz digital readout must be 3.000 GHz ±0.006 GHz.

5. Set TUNING control for an indication of 4.000 GHz on FREQUENCY GHz digital readout.

6. Center 4 GHz comb tooth on CRT display. FREQUENCY GHz digital readout must be 4.000 GHz ±0.008 GHz.

7. Select 3.8 — 8.5 FREQUENCY BAND GHz and set TUNING control for an indication of 5.000 GHz.

8. Center 5 GHz comb tooth on CRT display. FREQUENCY GHz digital readout must be 5.000 GHz ±0.010 GHz.

2-36. FREQUENCY SPAN WIDTH AND RESOLUTION BANDWIDTH ACCURACY TEST

SPECIFICATION:

Span Width Accuracy: The frequency error for any two points on the display for spans from 500 MHz to 20 kHz/Div (unstabilized) is less than ±5% of the indicted separation; for stabilized spans 100 kHz/Div to 20 kHz/Div and less, the error is less than ±15%.

Resolution bandwidth Accuracy: Individual resolution bandwidth 3 dB points < ±15%.

Switching between bandwidths: 3 MHz to 300 kHz, ±0.5 dB; 3 MHz to 1 kHz, ±1.0 dB (100 kHz BW limited to 90% RH). (3 MHz to 100 Hz ±1.0 dB for Option 100).

INCOMING INSPECTION TESTS

2-36. FREQUENCY SPAN WIDTH AND RESOLUTION BANDWIDTH ACCURACY TEST (Cont'd)

DESCRIPTION:

A comb generator is used to check the span width and the CAL OUTPUT signal is used to check resolution bandwidth accuracy at different positions of the FREQUENCY SPAN/DIV and RESOLUTION BW controls. By verifying the calibration of these controls, proper operation of the sweep circuits is also verified.

PROCEDURE:

a. Connect comb generator to 8565A INPUT 50Ω.

b. Set controls as follows:

Spectrum Analyzer:

Set all Normal Settings (controls marked in green)

FREQUENCY BAND GHz	.01 — 1.8
FREQUENCY SPAN/DIV	100 MHz
INPUT ATTEN	10 dB
REF LEVEL	−10 dBm
TUNING	0.500 GHz

Comb Generator:

Comb frequency	100 MHz
Output amplitude	Optimum

c. Tune spectrum analyzer to position one comb tooth at graticule reference line (far left).

d. Note position of ninth spectral line (comb tooth). It must be on eighth graticule line ±0.4 division. (See Figure 2-4).

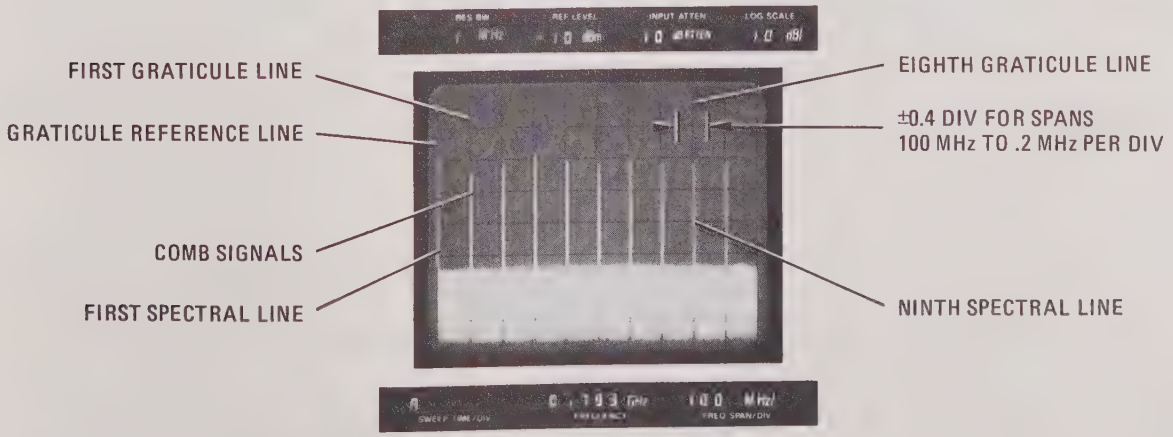


Figure 2-4. Span Width Accuracy Measurement

INCOMING INSPECTION TESTS

2-36. FREQUENCY SPAN WIDTH AND RESOLUTION BANDWIDTH ACCURACY TEST (Cont'd)

e. Set FREQUENCY SPAN/DIVto 10 MHz (with RESOLUTION BW coupled) and comb generator to 10 MHz. Repeat steps c and d.

f. Set FREQUENCY SPAN/DIV to 1 MHz and comb generator to 1 MHz. Repeat steps c and d.

NOTE

The wider FREQUENCY SPAN/DIV settings are checked using a comb generator. The narrow FREQUENCY SPAN/DIV settings are checked by observing RESOLUTION BW accuracy as follows:

g. Set FREQUENCY SPAN/DIV to .2 MHz, RESOLUTION BW to 1 MHz, and AMPLITUDE SCALE to 1 dB.

h. Connect spectrum analyzer CAL OUTPUT to INPUT 50Ω and tune spectrum analyzer to 0.100 GHz. Center signal on display and use REFERENCE LEVEL controls to position peak of signal to REFERENCE LEVEL line.

i. Note width of signal three divisions below REFERENCE LEVEL line. Specification: 5 divisions ±1.0 division. Verification of the 1 MHz RESOLUTION BW setting verifies proper operation of the LC bandwidth filters.

j. Set FREQUENCY SPAN/DIV to 10 kHz and RESOLUTION BW to 30 kHz.

k. Repeat step h and note width of signal three divisions below REFERENCE LEVEL line. Specification: 3 divisions ±0.9 division. Verification of the 30 kHz RESOLUTION BW setting verifies proper operation of the crystal (XTL) bandwidth filters.

l. Set FREQUENCY SPAN/DIV to 20 kHz and RESOLUTION BW to 1 kHz.

m. Center signal on display and adjust REFERENCE LEVEL controls to place peak of signal 1 division (1 dB) below REFERENCE LEVEL line.

n. Step RESOLUTION BW from 1 kHz to 3 MHz. Note change in signal level between bandwidth settings. Specification: 3 MHz to 300 kHz, ±0.5 dB; 3 MHz to 1 kHz, ±1.0 dB (100 kHz BW limited to 90% RH). (Option 100 3 MHz to 100 Hz ±1.0 dB).

NOTE

If amplitudes in step n are within specs, it can be assumed that all bandwidths are proper.

INCOMING INSPECTION TESTS

2-37. AMPLITUDE ACCURACY TEST

SPECIFICATIONS:

Calibrator Output: −10 dBm ±0.3 dB

Reference Level variation (Input Attenuator at 0 dB):
10 dB Steps: < ±0.5 dB (0 to −70 dBm)
< ±1.0 dB (0 to −90 dBm)

Vernier (0 to −12 dB) continuous: Maximum error < ±0.5 dB, when read from Reference Level Fine control.

Input Attenuator (at preselector input, 70 dB range in 10 dB steps):
Step size variation (for steps from 0 to 60 dB): < ±1.0 dB .01 to 18 GHz.

Maximum cumulative error (from 0 to 60 dB): < ±2.4 dB .01 to 18 GHz.

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked in green)

FREQUENCY SPAN/DIV	1 MHz
RESOLUTION BW	30 kHz (coupled)
FREQUENCY BAND GHz	.01 — 1.8
TUNING	0.100 GHz
INPUT ATTEN	10 dB
REF LEVEL	−10 dBm
REF LEVEL FINE	0
AMPLITUDE SCALE	1 dB LOG/DIV

b. Measure CAL OUTPUT signal level with a power meter. Specification: -10 dBm ±0.3 dB.

c. Connect 100 MHz CAL OUTPUT signal through 355D step attenuator (set to 0 dB) to INPUT 50Ω and tune spectrum analyzer to center signal on CRT display. Position peak of signal at REFERENCE LEVEL line with front-panel REF LEVEL CAL screwdriver adjustment.

d. To verify correct operation of the REF LEVEL FINE (Vernier) control, set 355D step attenuator to 10 dB. Set REF LEVEL FINE to −9. The peak of the signal on the CRT display should be one division below the REFERENCE LEVEL ±0.5 division (<±0.5 dB).

e. Set INPUT ATTEN to 70 dB, REF LEVEL to 0 dBm, REF LEVEL FINE to −8, RESOLUTION BW to 3 kHz, FREQUENCY SPAN/DIV to 1 kHz, and VIDEO FILTER to .03. Center signal on CRT display with TUNING control.

f. Adjust REF LEVEL CAL to position signal peak two divisions below REFERENCE LEVEL line.

g. Step 8565A INPUT ATTEN from 70 to 0 dB while stepping 355D step attenuator from 0 to 70 dB (maintain a total attenuation of 70 dB). For each 10 dB step, the signal amplitude should not change more than ±1 dB from the previous step. The total amplitude variation (difference between maximum and minimum signal levels over entire 70 dB range) should not exceed 2.4 dB.

INCOMING INSPECTION TESTS

2-37. AMPLITUDE ACCURACY TEST (Cont'd)

h. Adjust REF LEVEL CAL to position signal peak two divisions below REFERENCE LEVEL line.

i. Step 8565A REF LEVEL from −70 dBm to 0 dBm while stepping 355D step attenuator from 70 dB to 0 dB (maintain signal level approximately two divisions below REFERENCE LEVEL line). For each step, the signal amplitude should be two divisions below REFERENCE LEVEL line ±0.5 divisions (±0.5 dB).

Table 2-5. Incoming Inspection Test Record

Para. No.	Test Description	RESULTS		
		MIN	PASSED	MAX
2-35	TUNING ACCURACY TEST (INTERNAL MIXING)			
	b. CAL OUTPUT frequency	99.99 MHz	☐	100.01 MHz
	d. 1.8 GHz	1.795 GHz	☐	1.805 GHz
	3.0 GHz	2.994 GHz	☐	3.006 GHz
	4.0 GHz	3.992 GHz	☐	4.008 GHz
	5.0 GHz	4.990 GHz	☐	5.010 GHz
2-36	FREQUENCY SPAN WIDTH AND RESOLUTION BANDWIDTH ACCURACY TEST			
	d. 100 MHz FREQUENCY SPAN/DIV	– 0.4 div	☐	+ 0.4 div
	e. 10 MHz FREQUENCY SPAN/DIV	– 0.4 div	☐	+ 0.4 div
	f. 1 MHz FREQUENCY SPAN/DIV	– 0.4 div	☐	+ 0.4 div
	i. 1 MHz RESOLUTION BW	4.0 div	☐	6.0 div
	k. 30 kHz RESOLUTION BW	2.1 div	☐	3.9 div
	n. 3 MHz to 300 kHz		☐	1 dB (±0.5 dB)
	3 MHz to 1 kHz		☐	2 dB (±1.0 dB)
2-37	AMPLITUDE ACCURACY TEST			
	b. CAL output amplitude	– 9.7 dBm	☐	– 10.3 dBm
	d. Reference Level Fine	– 0.5 dB	☐	+ 0.5 dB
	g. Input Attenuator Step Size Variation	– 1.0 dB	☐	+ 1.0 dB
	Maximum Cumulative Error		☐	2.4 dB
	i. Reference Level Variation	– 0.5 dB	☐	+ 0.5 dB

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This operating section provides a basic introduction to signal analysis as well as detailed descriptions of how to use the HP Model 8565A. The information is presented in four chapters and five appendixes as follows:

a. Chapter 1: Operating the HP 8565A

b. Chapter 2: Detailed Control Operation

c. Chapter 3: Special Topics

d. Chapter 4: Typical Measurements

e. Appendix A: Operating Precautions

f. Appendix B: Control Glossary

g. Appendix C: Front Panel Adjustment Procedure

h. Appendix D: Theory of Operation

i. Appendix E: Amplitude Conversions

3-3. OPERATOR'S MAINTENANCE

3-4. Fuses. The 8565A has nine fuses, eight of which are internal. Only the ac line fuse located at the back of the instrument may be replaced by the operator. The ac line cord should be disconnected from the power source, then the other end disconnected from the instrument. With the power cord removed, access may be gained to the fuse compartment by sliding open the power module cover door. The fuse may be removed by pulling the lever inside the fuse compartment. Replace with fuse of correct rating and type for ac line voltage selected. Fuse ratings for different voltages are indicated below the power module. Access to the other eight fuses requires removing the instrument's covers. The internal fuses should only be replaced by a qualified service technician.

3-5. Air Filter. Inspect the rear-panel air filter frequently and, if necessary, remove and clean it. To clean the filter, wash it in warm water and detergent. Dry the filter thoroughly before reinstalling it on the instrument. Unrestricted air flow gives longest component life. Keep the air filter clean.

3-6. Calibration. To ensure that the 8565A meets specifications listed in Table 1-1, Performance Tests (Section IV) should be performed every six months.

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section test the electrical performance of the instrument using the specifications of Table 1-1 as the performance standards. Performance tests are designed to verify each specification in Table 1-1. All tests can be performed without access to the interior of the instrument.

4-3. The performance test procedures must be performed in the sequence given, since some procedures rely on satisfactory test results in preceding steps. If a test measurement is marginal, go to Section V and perform adjustment procedures. If a function fails to operate, go to Section VIII and perform troubleshooting.

NOTE

To ensure that the 8565A meets specifications listed in Table 1-1, Performance Tests should be performed every six months.

4-4. EQUIPMENT REQUIRED

4-5. Equipment required for the performance tests is listed in the Recommended Test Equipment, Table 1-3, in Section I. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model.

4-6. ABBREVIATED PERFORMANCE VERIFICATION

4-7. The Incoming Inspection Tests of Section II are designed to test only the most critical specifications and operating features of the instrument. The Incoming Inspection Tests require much less time and equipment than the complete Performance Tests in this section and are recommended for verification of overall instrument operation after repair.

PERFORMANCE TESTS

NOTE

Allow one hour warm-up time for 8565A Spectrum Analyzer and perform the front-panel adjustments described on the pull-out card (located under the instrument) before beginning Performance Tests.

4-8. TUNING ACCURACY TEST

SPECIFICATION

Overall tuning accuracy of the digital Frequency readout in any span mode:

Internal Mixing:

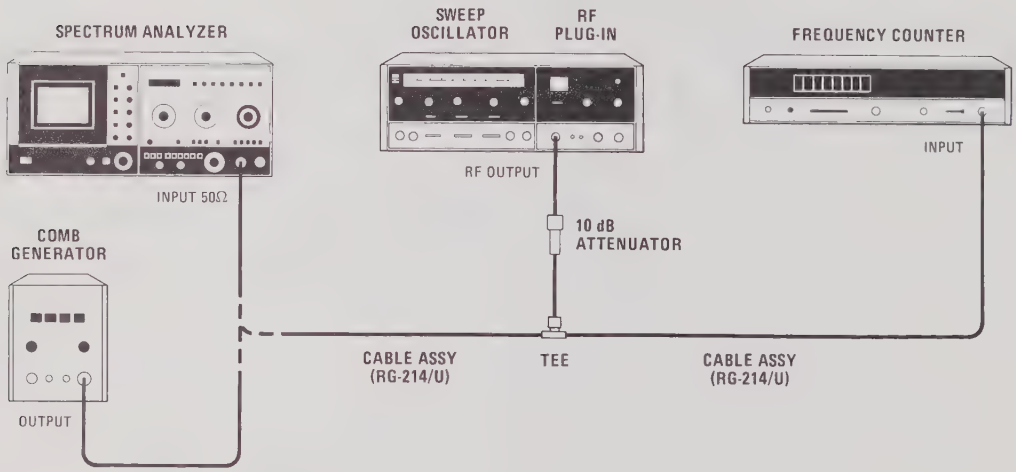
.01 to 2.5 GHz < ± 5 MHz ± 20% of FREQUENCY SPAN/DIV.
2.5 to 22 GHz < ± 0.2% ±20% of FREQUENCY SPAN/DIV.

External Mixing:

14.5 to 40 GHz < ± 0.7% of FREQUENCY SPAN/DIV.

4-8. TUNING ACCURACY TEST (Cont'd)

CONFIGURATION A



CONFIGURATION B

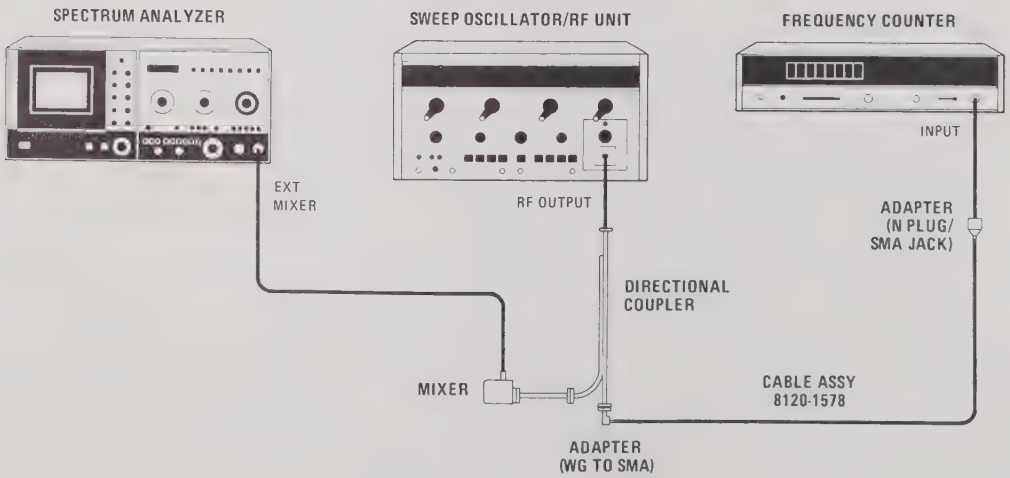


Figure 4-1. Tuning Accuracy Test Setup

4-8. TUNING ACCURACY TEST (Cont'd)

DESCRIPTION:

A comb generator is used to check the tuning accuracy in the low frequency bands (.01 GHz to 4.1 GHz; internal mixing). In the higher frequency bands (3.8 GHz to 22 GHz, internal mixing, and 14.5 GHz to 40 GHz, external mixing) a sweep oscillator is used and the frequencies are accurately tuned using a frequency counter. The signal, in each case, is tuned to the center graticule line of the spectrum analyzer using the TUNING control. The tuning accuracy is then indicated by the FREQUENCY readout.

In the two external mixing bands (14.5 — 26.6 GHz and 29.9 — 40 GHz) the tuning accuracy is checked at 23 GHz. An external mixer is used and the EXTernal MIXER BIAS is adjusted to produce the highest displayed signal level.

EQUIPMENT:

Sweep Oscillator/RF Plug-in	HP 8620C/86290A
Sweep Oscillator/RF Unit	HP 8690B/8696A
Frequency Counter	HP 5340A Opt. H10
Comb Generator	HP 8406A
Mixer	HP 11517A
Adapter, K-band to R-band	HP 11519A
Adapter, Waveguide to SMA Jack	Narda 4608
Directional Coupler (10 dB)	HP K752C
10 dB Attenuator	HP 8491B Opt. 010
Cable Assembly, SMA Plugs	HP 8120-1578
Cable Assembly, RG-214/U with Type N Connectors (2 required)	HP 11500A

PROCEDURE:

.01 to 4.1 GHz FREQUENCY BANDs (Internal Mixing):

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)	
FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	10 dB
REF LEVEL	−10 dBm
REF LEVEL FINE	0
RESOLUTION BW	Coupled (pushed in)
FREQUENCY SPAN/DIV	1 MHz

b. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω of spectrum analyzer and center signal on CRT with TUNING control.

c. Adjust FREQ CAL to indicate 0.100 GHz on FREQUENCY readout.

d. Connect equipment as shown in Configuration A of Figure 4-1 with comb generator connected to INPUT of spectrum analyzer.

PERFORMANCE TESTS

4-8. TUNING ACCURACY TEST (Cont'd)

e. Set comb generator for 10 MHz comb output. Adjust spectrum analyzer TUNING control for an indication of 0.010 GHz on FREQUENCY readout.

f. Set 10 MHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
.005 GHz	_____	.015 GHz

g. Set comb generator for 100 MHz comb output. Adjust spectrum analyzer TUNING control for an indication of 1.000 GHz on FREQUENCY readout.

h. Set 1 GHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
.995 GHz	_____	1.005 GHz

i. Adjust spectrum analyzer TUNING control for an indication of 1.800 GHz on FREQUENCY readout.

j. Set 1.8 GHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
1.795 GHz	_____	1.805 GHz

k. Set spectrum analyzer FREQUENCY BAND GHz to 1.7 — 4.1. Adjust TUNING control for an indication of 1.700 GHz on FREQUENCY readout (pull for rapid tuning).

l. Set 1.7 GHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
1.695 GHz	_____	1.705 GHz

m. Adjust spectrum analyzer TUNING control for an indication of 3.000 GHz on FREQUENCY readout. Set 3 GHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
2.994 GHz	_____	3.006 GHz

PERFORMANCE TESTS

4-8. TUNING ACCURACY TEST (Cont'd)

n. Adjust spectrum analyzer TUNING control for an indication of 4.100 GHz on FREQUENCY readout. Set 4.1 GHz comb tooth on center graticule line using TUNING control. FREQUENCY readout should indicate:

Min.	Actual	Max.
4.092 GHz	_____	4.108 GHz

3.8 to 22 GHz FREQUENCY BANDs (Internal Mixing)

o. Disconnect comb generator from spectrum analyzer input. Connect sweep oscillator and frequency counter as shown in Configuation A of Figure 4-1.

p. Check tuning accuracy at frequencies listed in Table 4-1. Set each frequency using the frequency counter. Adjust spectrum analyzer TUNING control to position signal on center graticule line. Indication on FREQUENCY GHz digital readout must be within the test limits given in Table 4-1.

Table 4-1. Tuning Accuracy Test Limits, 3.8 to 22 GHz Bands

Spectrum Analyzer		RF Source	FREQUENCY GHz Digital Readout Test Limits	
FREQUENCY BAND GHz	FREQUENCY SPAN/DIV (MHz)	FREQUENCY (GHz)*	Min.	Max.
3.8 – 8.5	1	3.800	3.793	3.807
3.8 – 8.5	1	6.000	5.988	6.012
3.8 – 8.5	1	8.500	8.483	8.517
5.8 – 12.9	1	5.800	5.789	5.811
5.8 – 12.9	1	8.000	7.984	8.016
5.8 – 12.9	1	12.900	12.875	12.925
8.5 – 18	1	8.500	8.483	8.517
8.5 – 18	1	12.500	12.475	12.525
8.5 – 18	1	18.000	17.964	18.036
10.5 – 22	1	10.500	10.479	10.521
10.5 – 22	1	16.500	16.467	16.533
10.5 – 22	1	22.000**	21.956	22.044

*Frequency set to within ±.05%.
**Use HP 8690B/8696A with appropriate adapters in place of 8620C/86290A, Configuration A of Figure 4-1.

14.5 to 40 GHz FREQUENCY BANDs (External Mixing)

q. Connect equipment as shown in Configuration B of Figure 4-1.

r. Set sweep oscillator frequency for indication of 23.000 ±0.010 GHz on frequency counter.

PERFORMANCE TESTS

4-8. TUNING ACCURACY TEST (Cont'd)

s. Set FREQUENCY SPAN/DIV to 10 MHz and press 14.5 — 26.6 FREQUENCY BAND GHz pushbutton on spectrum analyzer. Adjust TUNING control for an indication of 23.00 GHz on FREQUENCY readout.

t. Adjust EXT MIXER BIAS for greatest peak (peaking will occur in more than one position of BIAS control).

u. Set FREQUENCY SPAN/DIV to 1 MHz and identify 23 GHz signal using SIG IDENT. Adjust TUNING control to position 23 GHz signal on center graticule line. FREQUENCY readout should indicate:

Min.	Actual	Max.
22.84 GHz	_____	23.16 GHz

v. Set FREQUENCY SPAN/DIV to 10 MHz and press 22.9 — 40 FREQUENCY BAND GHz pushbutton. Adjust TUNING control for an indication of 23.00 GHz on FREQUENCY readout and repeat steps t and u.

4-9. SPAN WIDTH ACCURACY TEST

SPECIFICATION:

The frequency error for two points on the display for spans from 500 MHz/div to 20 kHz/div (unstabilized) is less than ±5% of the indicated separation; for stabilized spans 100 kHz/div and less, the error is less than ±15%.

DESCRIPTION:

The 500 MHz per division and 200 MHz per division span widths are checked using a wide-band source and a frequency counter. The source is set to 7 GHz and the spectrum analyzer is tuned to place the signal at the far-left graticule line. The source is then tuned to 11 GHz and the span error for 500 MHz per division is checked at the eighth graticule line (not counting the far-left reference graticule line). The 200 MHz per division span width accuracy is checked in the same manner.

The span width accuracy from 100 MHz per division down to 1 kHz per division is tested using a comb generator. Wide span widths (100 MHz to .5 MHz/div) are checked by using the 100 MHz, 10 MHz and 1 MHz comb generator outputs. Narrow span widths (.2 MHz to 1 kHz/div) are checked by using the comb generator output modulated by a function generator. Since the comb generator produces frequency components separated by a precisely determined frequency interval, the resultant spectral lines displayed on the CRT are evenly spaced when no span error exists in the instrument. Thus, span error is the cumulative variance of distance among the spectral line intervals displayed across the CRT. The amount of span error is determined by comparing the distance between the first eight graticule divisions to the display distance of the corresponding spectral line intervals.

PERFORMANCE TESTS

4-9. SPAN WIDTH ACCURACY TEST (Cont'd)

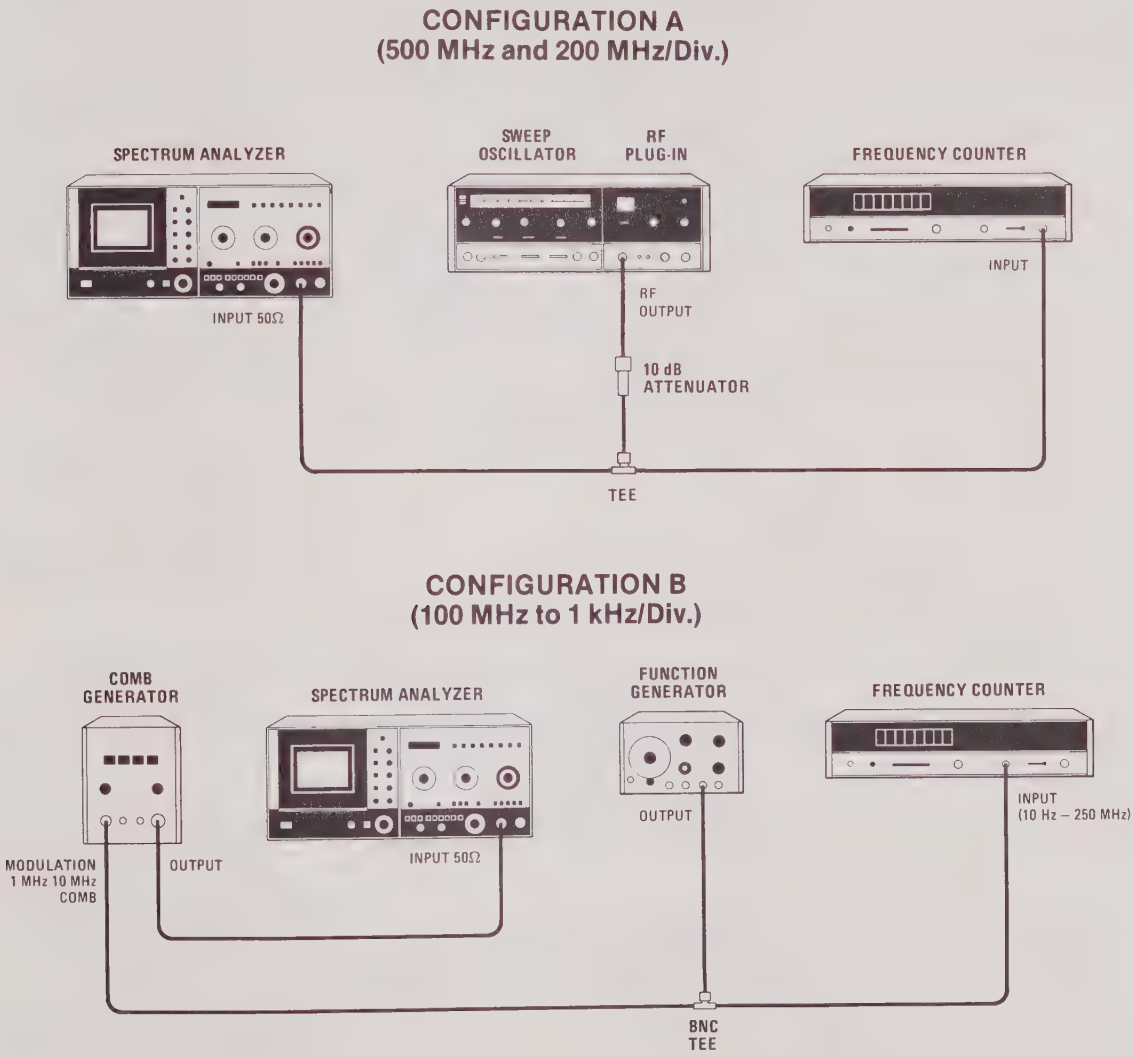


Figure 4-2. Span Width Accuracy Test Setup

EQUIPMENT:

Sweep Oscillator/RF Plug-in	HP 8620C/86290A
Frequency Counter	HP 5340A Opt. H10
Comb Genertor	HP 8406A
Function Genertor	HP 3312A
10 dB Attenuator	HP 8491B, Opt. 010

4-9. SPAN WIDTH ACCURACY TEST (Cont'd)

PROCEDURE:

500 MHz and 200 MHz Per Division

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... 5.8 — 12.9
INPUT ATTEN ..... 10 dB
REF LEVEL ..... −10 dBm
REF LEVEL FINE 0
RESOLUTION BW ..... Coupled (pushed in)
FREQUENCY SPAN/DIV ..... 500 MHz

b. Connect equipment as shown in Configuration A of Figure 4-2.

c. Set sweep oscillator for CW output, 6.0 to 12.4 GHz band, and tune for a frequency counter indication of 7.000 ± .005 GHz.

d. Adjust spectrum analyzer TUNING control to position signal at graticule reference line (far left) of display (Should indicate approximately 9.5 GHz on FREQUENCY readout.)

e. Tune sweep oscillator CW output for a frequency counter indication of 11.000 ±.005 GHz.

f. Measure error between signal peak and eighth graticule line. Error should not exceed ±0.4 division. (See Figure 4-3.)

g. Set spectrum analyzer FREQUENCY SPAN/DIV control to 200 MHz. Set TUNING control for a FREQUENCY readout of approximately 8 GHz.

h. Tune sweep oscillator CW output for a frequency counter indication of 7.000 ± .005 GHz. Adjust spectrum analyzer TUNING control to position signal at graticule reference line (far left) of display.

i. Tune sweep oscillator CW output for a frequency counter indication of 8.600 ± .005 GHz.

j. Measure error between signal peak and eighth graticule line. Error should not exceed ±0.4 division. (See Figure 4-3.)

k. Connect equipment as shown in Configuration B of Figure 4-2 without connecting function generator. Set comb generator for 100 MHz comb output.

l. Set spectrum analyzer FREQUENCY BAND GHz to .01 — 1.8, FREQUENCY SPAN/DIV control to 100 MHz. Set TUNING control for a FREQUENCY readout of 0.800 GHz.

m. Adjust spectrum analyzer TUNING control to position one spectral line (from comb generator) at graticule reference line (first graticule line at far left) of display. Measure error between ninth spectral line and eighth graticule line. Error should not exceed ± 0.4 division. (See Figure 4-4.)

4-9. SPAN WIDTH ACCURACY TEST (Cont'd)

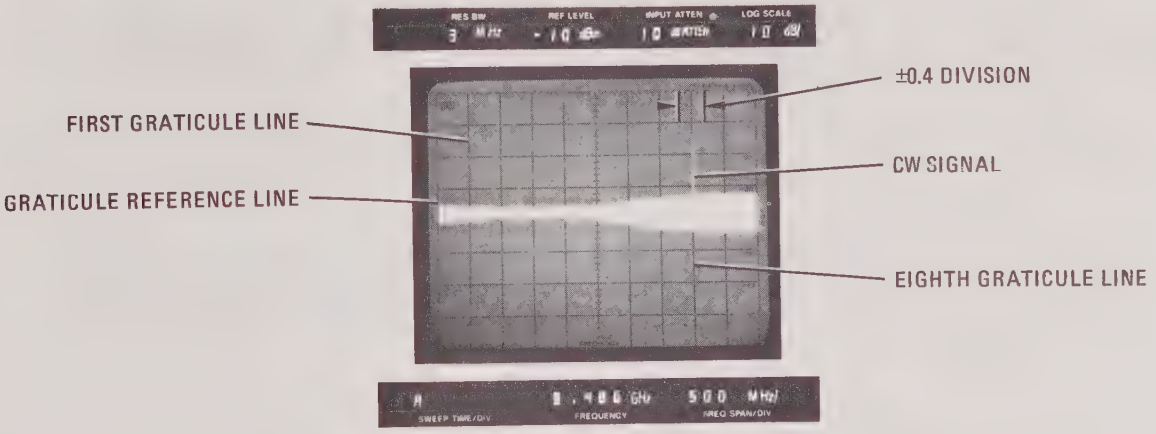


Figure 4-3. Span Width Accuracy Measurement, 500 MHz and 200 MHz per Division

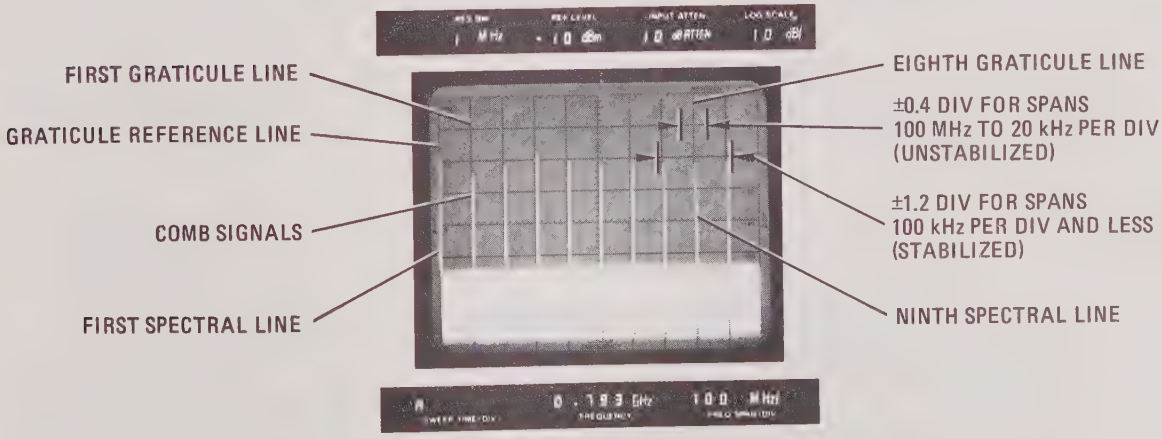


Figure 4-4. Span Width Accuracy Measurement, 100 MHz per Division and Less

n. Set FREQUENCY SPAN/DIV to 50 MHz. Adjust TUNING control to position one spectral line (from comb generator) at graticule reference line (first graticule line at far left) of display. Measure error between fifth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

o. Set comb generator for 10 MHz comb output. Set spectrum analyzer FREQUENCY SPAN/DIV to 20 MHz and RESOLUTION BW to OPTIMUM. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between seventeenth spectral line and eighth graticule line on display. Error should not exceed ±0.4 divison.

4-9. SPAN WIDTH ACCURACY TEST (Cont'd)

p. Set FREQUENCY SPAN/DIV to 10 MHz. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between ninth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

q. Set FREQUENCY SPAN/DIV to 5 MHz. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between fifth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

r. Set comb generator for 1 MHz comb output. Set spectrum analyzer FREQUENCY SPAN/DIV to 2 MHz and VIDEO FILTER to .1. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between seventeenth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

s. Set FREQUENCY SPAN/DIV to 1 MHz. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between ninth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

t. Set FREQUENCY SPAN/DIV to .5 MHz. Adjust TUNING control to position one spectral line at the graticule reference line. Measure error between fifth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

u. Set comb generator for 10 MHz comb output and turn interpolation control on. Connect function generator output level high output to modulate the comb generator. Set function generator frequency to 200 ± 1 kHz, set function to negative pulse, and set output level control for a clean 200 kHz comb (approximately mid-position) on the spectrum analyzer display.

NOTE

It may be necessary to readjust function generator output level control and comb generator interpolation amplitude control to obtain desired presentation of comb.

v. Set spectrum analyzer FREQUENCY SPAN/DIV to .2 MHz. Adjust TUNING control to position one spectral line at graticule reference line. Measure error between ninth spectral line and eighth graticule line. Error should not exceed ±0.4 division.

100 kHz to 5 kHz Per Division:

w. Using procedure of step u and v, change spectrum analyzer FREQUENCY SPAN/DIV and function generator output frequency in accordance with Table 4-2. Adjust spectrum analyzer TUNING control to position one spectral line at graticule reference line. Measure the span error between ninth spectral line and eighth graticule line.

NOTE

It may be necessary to temporarily disable the AUTO STABILIZER to tune the spectrum analyzer TUNING control for best comb presentation.

4-9. SPAN WIDTH ACCURACY TEST (Cont'd)

Table 4-2. Narrow Span Width Error Measurement

Spectrum Analyzer		Function Generator Output Frequency*	Maximum Allowable Error (Division)	
FREQ SPAN/DIV	RESOLUTION BW		Unstabilized	Stabilized
100 kHz	OPTIMUM	100 kHz	±0.4	±1.2
50 kHz	OPTIMUM	50 kHz	±0.4	±1.2
20 kHz	OPTIMUM	20 kHz	±0.4	±1.2
10 kHz	OPTIMUM	10 kHz		±1.2
5 kHz	OPTIMUM	5 kHz		±1.2

*Check function generator output frequency using an electronic counter. Frequency readout should be within ±0.5% of desired audio frequency.

2 kHz and 1 kHz Per Division

x. Set spectrum analyzer AMPLITUDE SCALE to 5 dB (LOG/DIV), REF LEVEL to −70 dBm, VIDEO FILTER to .03, and FREQUENCY SPAN/DIV to 2 kHz.

y. Set function generator frequency to 4.00 ± .02 kHz. Adjust spectrum analyzer TUNING control to position one spectral line at graticule reference line. Measure error between fifth spectral line and eighth graticule line. Error should not exceed ± 1.2 divisions.

z. Set spectrum analyzer FREQUENCY SPAN/DIV to 1 kHz. Set function generator frequency to 2.00 ± .02 kHz and adjust spectrum analyzer TUNING control to position one spectral line at graticule reference line. Measure error between fifth spectral line and eighth graticule line. Error should not exceed ± 1.2 divisions.

4-10. RESOLUTION BANDWIDTH ACCURACY TEST

SPECIFICATION:

Individual resolution bandwidth 3 dB points:

$< \pm 15\%$

DESCRIPTION:

Resolution bandwidth accuracy is measured in the linear mode to eliminate log amplifier errors. Since half power is represented by a voltage ratio of 1.41, 5 divisions on the spectrum analyzer display represents half power (3 dB) points for a 7.1 division display.

$$\frac{1}{1.41} = \text{(Voltage Ratio)} = \frac{\text{X Div}}{7.1\ \text{DIV}} \rightarrow \text{X DIV} = \frac{7.1\ \text{DIV}}{1.4} = 5.0\ \text{DIV}$$

4-10. RESOLUTION BANDWIDTH ACCURACY TEST (Cont'd)

In the narrow bandwidths (10 kHz and below) a 321.4 MHz signal (first IF) is injected by connecting the output of the signal generator to the external mixer port of the spectrum analyzer. This IF injection method provides the high degree of stability required when measuring narrow resolution bandwidths.

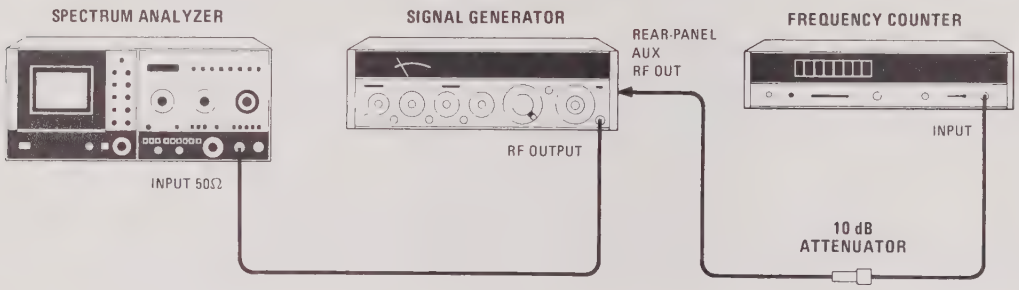


Figure 4-5. Resolution Bandwidth Accuracy Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Frequency Counter	HP 5340A
10 dB Attenuator	HP 8491 B Opt. 010

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	20 dB
REF LEVEL	—10 dBm
REF LEVEL FINE	0
RESOLUTION BW	3 MHz, Uncoupled
FREQUENCY SPAN MODE	ZERO SPAN
AMPLITUDE SCALE	LIN
AUTO STABILIZER	OFF

b. Set signal generator for an unmodulated 100 MHz output at approximately −10 dBm. Set 8640B counter mode to internal.

c. Adjust spectrum analyzer TUNING control to locate peak of 100 MHz signal on CRT. Reduce signal generator output if necessary.

d. Adjust signal generator output level to position trace at 7.1 divisions above graticule baseline.

4-10. RESOLUTION BANDWIDTH ACCURACY TEST (Cont'd)

e. Tune signal generator frequency until trace drops to 5 divisions above graticule baseline. Record frequency displayed on 8640B.

_____ MHz

f. Tune signal generator frequency in opposite direction of step e until trace peaks (7.1 divisions) and then drops to 5 divisions above graticule baseline. Record frequency displayed on 8640B.

_____ MHz

g. The difference between results of steps e and f is the measured resolution bandwidth at 3 dB points.

Min.	Actual	Max.
2.55 MHz	_____	3.45 MHz

h. Set RESOLUTION BW to 1 MHz. Tune signal generator to 100 MHz and repeat steps c through g.

Min.	Actual	Max.
850 kHz	_____	1.15 MHz

i. Set RESOLUTION BW to 300 kHz. Tune signal generator to 100 MHz and repeat steps c through g.

Min.	Actual	Max.
255 kHz	_____	345 kHz

j. Set RESOLUTION BW to 100 kHz. Tune signal generator to 100 MHz and repeat steps c through g.

Min.	Actual	Max.
85 kHz	_____	115 kHz

k. Set RESOLUTION BW to 30 kHz. Tune signal generator to 100 MHz and press EXPAND X10 pushbutton to provide greater resolution on frequency readout (remember to include overflow when reading frequency). Enable spectrum analyzer AUTO STABILIZER (pushbutton out) and repeat steps c through g.

Min.	Actual	Max.
25.5 kHz	_____	34.5 kHz

l. Set RESOLUTION BW to 10 kHz. Set EXT MIXER BIAS adjustment fully counterclockwise.

m. Tune signal generator to 321.4 MHz. Connect signal generator output to spectrum analyzer EXT MIXER BNC connector. Press 1.7 — 4.1 FREQUENCY BAND GHz pushbutton.

n. Connect frequency counter as shown in Figure 4-5 and set frequency counter resolution to 10 Hz.

o. Tune signal generator FINE TUNE control to peak signal on CRT. Adjust output level to position trace at 7.1 divisions above graticule baseline.

4-10. RESOLUTION BANDWIDTH ACCURACY TEST (Cont'd)

p. Tune signal generator frequency, using FINE TUNE control, until trace drops to 5 divisions above graticule baseline. Record frequency displayed on frequency counter.

_____ MHz

q. Tune signal generator frequency (FINE TUNE) in opposite direction of step p until trace peaks (7.1 divisions) and then drops to 5 divisions above graticule baseline. Record frequency displayed on frequency counter.

_____ MHz

r. The difference between results of steps p and q is the measured resolution bandwidth at 3 dB points.

Min.	Actual	Max.
8.5 kHz	_____	11.5 kHz

s. Set spectrum analyzer RESOLUTION BW to 3 kHz and repeat steps o through r.

Min.	Actual	Max.
2.55 kHz	_____	3.45 kHz

t. Set spectrum analyzer RESOLUTION BW to 1 kHz and repeat steps o through r.

Min.	Actual	Max.
0.85 kHz	_____	1.15 kHz

Option 100 Only

u. Set spectrum analyzer RESOLUTION BW to .3 kHz and repeat steps o through r.

Min.	Actual	Max.
255 Hz	_____	345 Hz

v. Set spectrum analyzer RESOLUTION BW to .1 kHz and repeat steps o through r.

Min.	Actual	Max.
85 Hz	_____	115 Hz

4-11. RESOLUTION BANDWIDTH SELECTIVITY TEST

SPECIFICATION:

(60 dB/3 dB bandwidth ratio) < 15:1 for bandwidths 1 kHz to 3 MHz.

< 11:1 for bandwidths .1 kHz, .3 kHz, and 1 kHz with Option 100.

PERFORMANCE TESTS

4-11. RESOLUTION BANDWIDTH SELECTIVITY TEST (Cont'd)

DESCRIPTION:

The 60 dB bandwidth is measured for all resolution bandwidth settings (1 kHz to 3 MHz). The 60 dB to 3 dB resolution bandwidth ratio (shape factor) is then computed by dividing the 3 dB bandwidth values, obtained in the Resolution Bandwidth Accuracy Test, into the 60 dB bandwidth values for each resolution bandwidth setting.

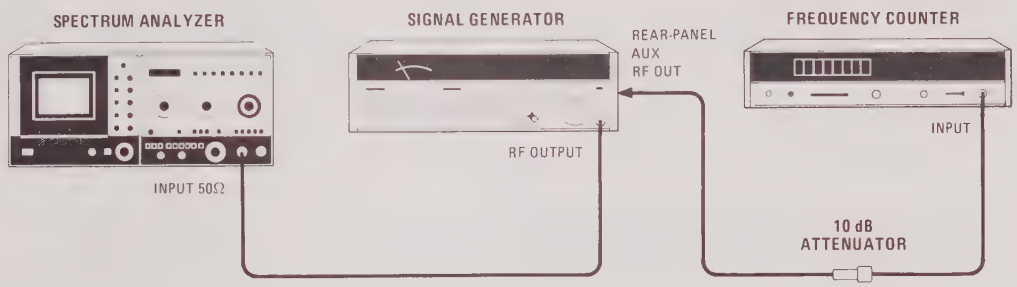


Figure 4-6. Resolution Bandwidth Selectivity Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Frequency Counter	HP 5340A
10 dB Attenuator	HP 8491B Opt. 010

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	1.7 — 4.1
INPUT ATTEN	20 dB
REF LEVEL	−10 dBm
REF LEVEL FINE	0
RESOLUTION BW	1 kHz, Uncoupled
FREQUENCY SPAN MODE	ZERO SPAN
AMPLITUDE SCALE	10 dB LOG/DIV
VIDEO FILTER	.03

b. Connect equipment as shown in Figure 4-6. Tune signal generator to 321.4 MHz and set output level to approximately −10 dBm. Connect signal generator output to spectrum analyzer EXT MIXER BNC connector.

c. Tune signal generator FINE TUNE control to peak signal on CRT. Adjust output level to position trace at top graticule line.

4-11. RESOLUTION BANDWIDTH SELECTIVITY TEST (Cont'd)

d. Tune signal generator frequency (FINE TUNE) until trace drops to two divisions above graticule baseline. Record frequency displayed on frequency counter.

_____ MHz

e. Tune signal generator frequency in opposite direction of step d until trace peaks and then drops to two divisions above graticule baseline. Record frequency displayed on frequency counter.

_____ MHz

f. The difference between results of steps d and e is the measured bandwidth at 60 dB points.

NOTE

If 8565A has Option 100 installed, perform all of the following steps. If Option 100 is not installed, proceed to step j.

g. Record measured bandwidth (difference between results of steps d and e).

_____ Hz (.1 kHz Bw)

h. Set RESOLUTION BW to .3 kHz and repeat steps c through f.

_____ Hz (.3 kHz BW)

i. Set RESOLUTION BW to 1 kHz and repeat steps c through f.

j. Record measured bandwidth (difference between results of steps d and e).

_____ kHz (1 kHz BW)

k. Set RESOLUTION BW to 3 kHz and repeat steps c through f.

_____ kHz (3 kHz BW)

l. Set RESOLUTION BW to 10 kHz and repeat steps c through f.

_____ kHz (10 kHz BW)

m. Connect signal generator output to spectrum analyzer INPUT 50Ω connector. Tune signal generator to 100 MHz and set output level to approximately 0 dBm.

n. Set spectrum analyzer FREQUENCY BAND GHz to .01 — 1.8, INPUT ATTEN to 10 dB, REF LEVEL to 0 dBm, RESOLUTION BW to 30 kHz, and TUNING for an indication of 0.100 GHz on FREQUENCY readout (disable AUTO STABILIZER while using coarse TUNING).

PERFORMANCE TESTS

4-11. RESOLUTION BANDWIDTH SELECTIVITY TEST (Cont'd)

o. Tune signal generator frequency to peak signal on CRT. Adjust output level to position trace at top graticule line.

p. Tune signal generator frequency until trace drops to two divisions above graticule baseline. Record frequency displayed on 8640B.

_____ MHz

q. Tune signal generator frequency in opposite direction of step P until trace peaks and then drops to two divisions above graticule baseline. Record frequency displayed on 8640B.

_____ MHz

r. The difference between results of steps p and q is the measured bandwidth at 60 dB points.

_____ MHz (30 kHz BW)

s. Set RESOLUTION BW to 100 kHz and repeat steps o through r.

_____ MHz (100 kHz BW)

t. Set RESOLUTION BW to 300 kHz and repeat steps o through r.

_____ MHz (300 kHz BW)

u. Set RESOLUTION BW to 1 MHz and repeat steps o through r.

_____ MHz (1 MHz BW)

v. Set RESOLUTION BW to 3 MHz and repeat steps o through r.

_____ MHz (3 MHz BW)

w. Record the measured 3 dB bandwidths from Paragraph 4-10, steps g through k and steps r through t (steps r through v for Option 100).

x. Record the measured 60 dB bandwidths from Paragraph 4-11, steps j through l (steps g through l for Option 100) and steps r through v in Table 4-3.

y. Compute Resolution Bandwidth Selectivity for each RESOLUTION BW setting, dividing the measured 60 dB bandwidth by the measured 3 dB bandwidth for each setting. Ratios should be less than 15:1 for RESOLUTION BW settings 3 MHz to 1 kHz with standard 8565A. With Option 100 instruments, ratios should be less than 15:1 for RESOLUTION BW settings 3 MHz to 3 kHz, and less than 11:1 for RESOLUTION BW settings 1 kHz, .3 kHz, and .1 kHz.

4-11. RESOLUTION BANDWIDTH SELECTIVITY TEST (Cont'd)

Table 4-3. Resolution Bandwidth Selectivity

RESOLUTION BW Setting	MEASURED 3 dB BW	MEASURED 60 dB BW	Resolution Bandwidth Selectivity (60 dB BW/3 dB BW)
3 MHz			
1 MHz			
300 kHz			
100 kHz			
30 kHz			
10 kHz			
3 kHz			
1 kHz			
.3 kHz*			
.1 kHz*			

*Option 100 only.

4-12. RESIDUAL FM TEST

SPECIFICATION:

Total residual FM:

Stabilized: <200 Hz P-P in 0.1 sec. (<100 Hz P-P in 0.1 sec. for Option 100) .01 to 8.5 GHz
Unstabilized: <10 kHz P-P in 0.1 sec. .01 to 4.1 GHz (fundamental mixing)

DESCRIPTION:

A comb generator is used to supply a stable 1.8 GHz signal to the spectrum analyzer. The relationship between amplitude and frequency on the linear portion of the trace is determined for a given frequency span and resolution bandwidth. The residual FM is then slope detected by using the spectrum analyzer as a fixed-tuned receiver (ZERO SPAN). Using the determined relationship between amplitude and frequency, the test limits (in divisions) for the demodulated residual FM are determined.

4-12. RESIDUAL FM TEST (Cont'd)

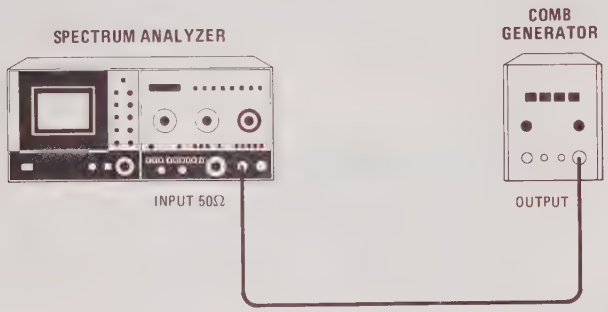


Figure 4-7. Residual FM Test Setup

EQUIPMENT:

Comb Generator ..... HP 8406A

PROCEDURE:

Stabilized:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... .01 — 1.8
INPUT ATTEN ..... 0 dB
REF LEVEL ..... −30 dBm
RESOLUTION BW ..... Coupled (pushed in)
FREQUENCY SPAN/DIV ..... .2 MHz
AMPLITUDE SCALE ..... LIN
SWEEP TIME/DIV ..... .1 SEC
VIDEO FILTER 1
TUNING ..... 1.800 GHz

b. Connect comb generator output to spectrum analyzer INPUT as shown in Figure 4-7. Set comb generator for maximum output amplitude.

c. Locate 1.8 GHz comb tooth and center it on CRT. Reduce FREQUENCY SPAN/DIV to 2 kHz keeping signal centered on CRT with FINE TUNING control.

d. Adjust REF LEVEL FINE control to place signal peak at top graticule line. Carefully adjust TUNING control so upward slope of signal intersects the CENTER FREQUENCY graticule line one division down from the top as shown in Figure 4-8.

NOTE

With AUTO STABILIZER on, the coarse TUNING control (large knob) can be adjusted in very small increments to "fine tune" the position of the signal displayed. If signal disappears from display, set FREQUENCY SPAN/DIV to .2 MHz and repeat steps c and d.

4-12. RESIDUAL FM TEST (Cont'd)

e. Note the distance from the signal skirt at the horizontal center graticule line to the CENTER FREQUENCY graticule line at the center of the CRT. (In Figure 4-8 the distance is 0.2 division.)

_____ Div.

f. Determine the test limit by using the following formula:

Test Limit: _____ Div. (P-P per One Horizontal Division)

$$X = \frac{\text{Specification (P-P)}}{\frac{\text{A div}}{\text{k div}} \times \text{FREQ. SPAN/DIV}}$$

Where: X = Test limit (peak-to-peak) in vertical divisions per one horizontal division.
A div = Distance noted in step e or step m.
k div = Linear vertical portion of trace = 3 div.

Typical Example (Stabilized mode): In Figure 4-8, distance A is 0.2 division and distance k (a constant) is 3 divisions. Therefore:

$$X = \frac{200\ \text{Hz}^*}{\frac{0.2\ \text{div}}{3\ \text{div}} \times 2\ \text{kHz/Div}} = \frac{200\ \text{Hz}^*}{.067 \times 2\ \text{kHz/Div}} = 1.5\ \text{Div (P-P per one Horiz Division)}$$

*Use 100 Hz for instrument with Option 100 installed.

g. Press ZERO SPAN pushbutton and adjust TUNING control to place trace between center graticule line and seventh graticule line (linear portion of signal).

NOTE

With AUTO STABILIZER on, the coarse TUNING control (large knob) can be adjusted in small increments to "fine tune" the position of the signal displayed.

h. Adjust PERSIST and INTENSITY controls to provide high persistence with minimum blooming.

i. Set SWEEP TRIGGER to SINGLE and ERASE CRT. Press START/RESET pushbutton to display one sweep as shown in Figure 4-9. The maximum peak-to-peak variation should not exceed the test limit determined in step f for each horizontal division (since SWEEP TIME/DIV is .1 SEC and residual FM is specified in a time interval of 0.1 second).

4-12. RESIDUAL FM TEST (Cont'd)

j. Repeat steps a through i except set FREQUENCY BAND GHz to 3.8 — 8.5 and TUNING to 8.500 GHz. Locate 8.5 GHz comb tooth in step c.

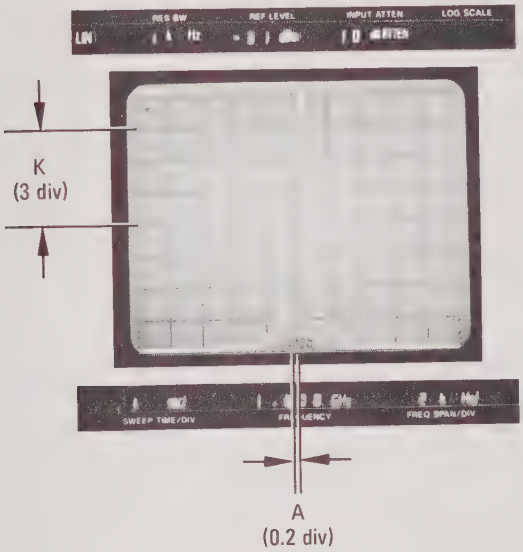


Figure 4-8. Residual FM to AM Conversion Display

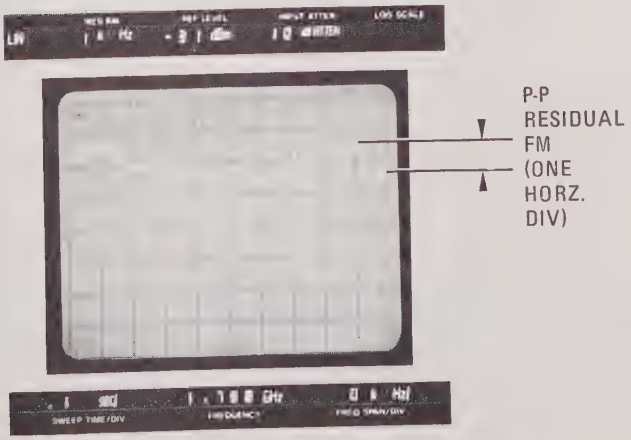


Figure 4-9. Residual FM Display

4-12. RESIDUAL FM TEST (Cont'd)

Unstabilized:

k. Set FREQUENCY SPAN MODE to PER DIV, FREQUENCY SPAN/DIV to 10 kHz (pull to uncouple), and RESOLUTION BW to 30 kHz. Set SWEEP TRIGGER to FREE RUN and press AUTO STABILIZER to OFF (pushbutton in).

l. Locate 1.8 GHz comb tooth and center it on CRT. Press AUTO STABILIZER to ON (pushbutton out) to return to stabilized mode.

m. Adjust REF LEVEL FINE control to place signal peak at top graticule line. Carefully adjust TUNING control so upward slope of signal intersects the CENTER FREQUENCY graticule line one division down from the top as shown in Figure 4-8.

n. Note the distance from the signal skirt at the horizontal graticule center line, to the CENTER FREQUENCY graticule line (should be approximately 1.3 divisions).

_____ Div.

o. Determine the test limit using formula given in step f. Use unstabilized specification (10 kHz) and 10 kHz FREQUENCY SPAN/DIV.

Test Limit: _____ Div. (P-P per One Horizontal Division)

Typical Example (Unstabilized mode):

If A = 1.3 divisions, then:

$$X = \frac{10\ \text{kHz}}{\frac{1.3\ \text{div.}}{3\ \text{div}}} \times 10\ \text{kHz/div.}$$

$$X = \frac{1}{0.43}\ \text{div.}$$

X = 2.3 div. (P-P per One Horizontal Division)

p. Press AUTO STABILIZER to OFF (pushbutton in for unstabilized mode). Press ZERO SPAN Pushbutton and adjust FINE TUNING control to place trace between center graticule line and seventh graticule line.

q. Adjust PERSIST and INTENSITY controls to provide high persistence with minimum blooming.

4-12. RESIDUAL FM TEST (Cont'd)

r. Set SWEEP TRIGGER to SINGLE and ERASE CRT. Press START/RESET pushbutton to display one sweep as shown in Figure 4-9. The maximum peak-to-peak variation should not exceed the test limit determined in step o.

4-13. NOISE SIDEBANDS TEST

SPECIFICATION:

At least 70 dB down, greater than 30 kHz from center of CW signal when set to a 1 kHz RESOLUTION BANDWIDTH and a 10 Hz (.01) VIDEO FILTER.

DESCRIPTION:

A comb generator is used to supply a stable 1.8 GHz signal to the spectrum analyzer. The analyzer RESOLUTION BW is set to 1 kHz and VIDEO FILTER is set to .01. The peak of the 1.8 GHz signal is set at 20 dB above REFERENCE LEVEL graticule line to allow greater readability of the noise sidebands. The noise-associated sidebands and unwanted responses measured close to the signal must be more than 70 dB down (below −50 graticule line), greater than 30 kHz from center of CW signal.

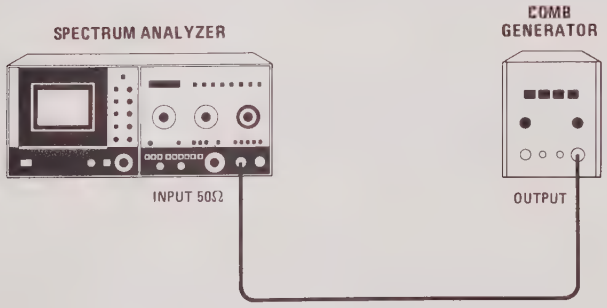


Figure 4-10. Noise Sidebands Test Setup

EQUIPMENT:

Comb Generator ..... HP 8406A

4-13. NOISE SIDEBANDS TEST (Cont'd)

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	0 dB
REF LEVEL	−30 dBm
RESOLUTION BW	Coupled (pushed in)
FREQUENCY SPAN/DIV	.2 MHz
TUNING	1.800 GHz

b. Connect comb generator output to spectrum analyzer INPUT as shown in Figure 4-10. Set comb generator for maximum output amplitude.

c. Locate 1.8 GHz comb tooth and center it on CRT. Reduce FREQUENCY SPAN/DIV to 10 kHz keeping signal centered on CRT with FINE TUNING control.

d. Adjust REF LEVEL FINE control to place signal peak at top graticule line (REFERENCE LEVEL).

e. Set REF LEVEL control to −50 dBm to place signal peak 20 dB above REFERENCE LEVEL.

f. Set SWEEP TRIGGER to SINGLE and set VIDEO FILTER to .01. Set PERSIST control fully clockwise and press START/RESET pushbutton. If blooming occurs, reduce INTENSITY, ERASE CRT, and press START/RESET pushbutton again.

g. Observe noise level at three divisions (30 kHz) and greater on each side of CW signal. Noise sidebands should be greater than 70 dB below cw signal level (below −50 graticule line).

4-14. RESIDUAL RESPONSES TEST

SPECIFICATION:

Residual Responses (no signal present at input): With 0 dB input attenuation on fundamental mixing (.01 to 4.1 GHz): < -90 dBm.

DESCRIPTION:

Signals present on the display with no input to the analyzer are residual responses. A reference level is selected that will allow the operator to see signals less than −90 dBm. The two fundamental mixing bands (.01 — 1.8 GHz and 1.7 — 4.1 GHz) are slowly swept through their entire ranges in several incremental spans while observing the display. Any residual responses that appear must be less than −90 dBm.

EQUIPMENT:

50Ω Termination	HP 909A Opt. 012

4-14. RESIDUAL RESPONSES TEST (Cont'd)

PROCEDURE:

a. Connect 50-ohm termination to INPUT 50Ω port and set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	0 dB
REF LEVEL	−60 dBm
REF LEVEL FINE	0
RESOLUTION BW	10 kHz, Uncoupled
FREQUENCY SPAN/DIV	10 MHz
VIDEO FILTER	.1
SWEEP TRIGGER	SINGLE
TUNING	0.060 GHz
PERSIST	Fully Clockwise
INTENSITY	12 O'clock

b. Press START/RESET pushbutton and turn BASELINE CLIPPER control clockwise until just the peaks of the noise are displayed. ERASE CRT and press START/RESET again. Any residual responses that appear must be less than −90 dBm (below the −30 graticule line).

c. Adjust TUNING control for an indication of 0.150 GHz on FREQUENCY readout. Press START/RESET pushbutton and observe display.

d. Continue tuning spectrum analyzer in 100 MHz increments (0.250 GHz, 0.350 GHz, and so on) up to 1.750 GHz. Check for residual responses in each position of the TUNING control by pressing START/RESET pushbutton and observing CRT display. ERASE CRT occasionally to prevent blooming.

e. Set RESOLUTION BW to 3 kHz. Leave FREQUENCY SPAN/DIV set to 10 MHz. Set SWEEP TIME/DIV to 5 SEC and press 1.7 — 4.1 FREQUENCY BAND GHz pushbutton. Adjust TUNING control for an indication of 1.750 GHz on FREQUENCY readout and set BASELINE CLIPPER control fully clockwise.

f. Repeat step b.

g. Tune spectrum analyzer in 100 MHz increments (1.850 GHz, 1.950 GHz, and so on) up to 4.050 GHz. Check for residual responses in each position of the TUNING control by pressing START/RESET pushbutton and observing CRT display. ERASE CRT occasionally to prevent blooming.

4-15. AVERAGE NOISE LEVEL TEST

SPECIFICATION:

Maximum average noise level (internal mixer) with 1 kHz IF bandwidth, 0 dB attenuation, and .003 (3 Hz) video filter is given in Table 4-4.

4-15. AVERAGE NOISE LEVEL TEST (Cont'd)

Table 4-4. Average Noise Level Specification

FREQUENCY BAND GHz	First IF (MHz)	Harmonic Mode	Average Noise Level	
			Standard (dBm)	Option 200 (dBμV)
.01 – 1.8	2050	1–	–110	–3
1.7 – 4.1	321.4	1–	–106	+1
3.8 – 8.5	321.4	2–	–102	+5
5.8 – 12.9	321.4	3–	–92	+15
8.5 – 18	321.4	4+	–83	+24
10.5 – 22	321.4	5+	–72	+35

DESCRIPTION:

Maximum average noise level is checked in all internal mixer frequency bands. Each frequency band is slowly swept with FREQUENCY SPAN/DIV control set to F, RESOLUTION BW set to 1 kHz, and VIDEO FILTER set to .003. Maximum persistence is used to store all six internal mixer frequency band traces. The traces are observed and average noise level for each frequency band is recorded.

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... .01 — 1.8
INPUT ATTEN ..... 0 dB
REF LEVEL ..... –70 dBm
REF LEVEL FINE 0
RESOLUTION BW ..... 1 kHz, Uncoupled
FREQUENCY SPAN/DIV ..... F
SWEEP TRIGGER ..... SINGLE
SWEEP TIME/DIV ..... 2 SEC
VIDEO FILTER ..... .003
PERSIST ..... Fully Clockwise
INTENSITY ..... Fully Counterclockwise
TUNING ..... 0.900 GHz

b. Press START/RESET pushbutton and adjust INTENSITY control until trace appears on CRT. Press ERASE pushbutton and again press START/RESET pushbutton.

c. When first sweep is ended, press 1.7 — 4.1 FREQUENCY BAND GHz pushbutton and then START/RESET pushbutton. Continue pressing the next FREQUENCY BAND GHz pushbutton and then START/RESET pushbutton at the end of each sweep until all of the internal mixer frequency bands (dark gray pushbuttons) have been swept.

d. Press STORE and adjust STORE INTEN control as required. Observe the six individual traces and determine the maximum average noise level for each internal mixing FREQUENCY BAND. (See Figure 4-11.) Disregard LO feedthrough signal at beginning of .01 — 1.8 GHz band. Record results in Table 4-5.

4-15. AVERAGE NOISE LEVEL TEST (Cont'd)

Table 4-5. Average Noise Level

FREQUENCY BAND GHz	First IF (MHz)	Harmonic Mode	Average Noise Level		
			Maximum		Actual
			Standard (dBm)	Opt. 200 (dBμV)	
.01 – 1.8	2050	1 -	–110	–3	_____
1.7 – 4.1	321.4	1 –	–106	+1	_____
3.8 – 8.5	321.4	2–	–102	+5	_____
5.8 – 12.9	321.4	3–	–92	+15	_____
8.5 – 18	321.4	4+	–83	+24	_____
10.5 – 22	321.4	5+	–72	+35	_____

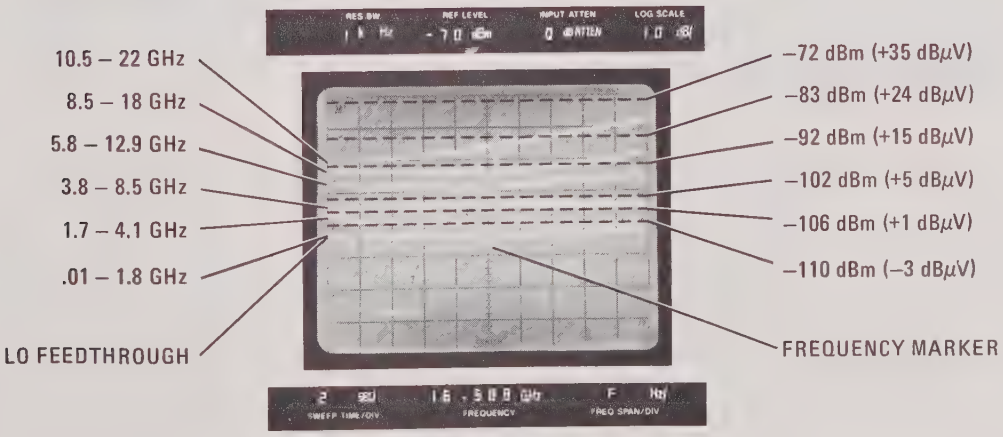


Figure 4-11. Average Noise Level (Sensitivity) Internal Mixing Frequency Bands

e. Set PERSIST control fully counterclockwise and press WRITE pushbutton. Reduce INTENSITY.

4-16. REFERENCE LEVEL VARIATION TEST

SPECIFICATION:

Reference level variation (Input Attenuator at 0 dB):

10 dB steps: $< \pm 0.5$ dB (0 to -70 dBm)
$< \pm 1.0$ dB (0 to -90 dBm)

Vernier (0 to -12 dB) continuous: Maximum error $< \pm$ 0.5 dB, when read from Reference Level Fine control.

DESCRIPTION:

The reference level variation is tested by checking the IF gain steps in 1 dB per division log and in linear scale. Specially calibrated step attenuators (355 C/D Option H80) are used to check the 10 dB steps and the vernier (REF LEVEL FINE control).

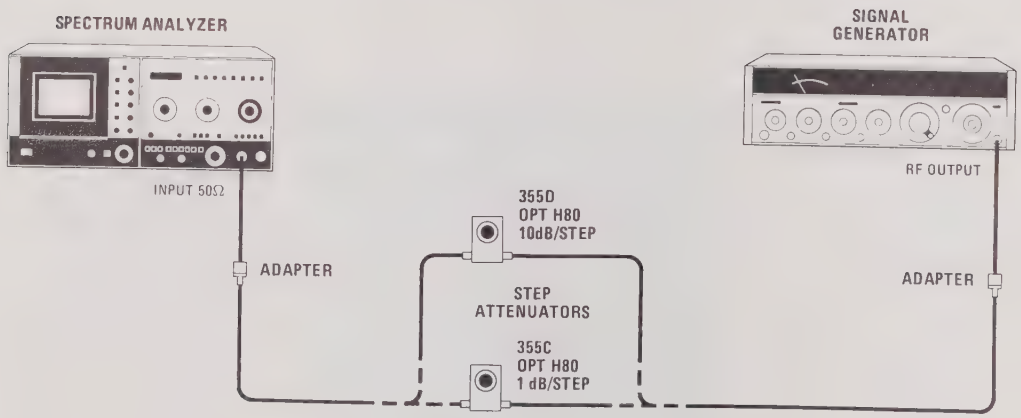


Figure 4-12. Reference Level Variation Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Step Attenuator (1 dB/Step)	HP 355C Opt. H80
Step Attenuator (10 dB/Step)	HP 355D Opt. H80
Adapter, Type N Male to BNC Female (2 required)	HP 1250-0780

4-16. REFERENCE LEVEL VARIATION TEST (Cont'd)

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz. . . . . .01 — 1.8
INPUT ATTEN . . . . . 0 dB
REF LEVEL . . . . . 0 dBm
REF LEVEL FINE. 0
RESOLUTION BW . . . . . Coupled (pushed in)
FREQUENCY SPAN/DIV . . . . . 1 MHz
TUNING. . . . . 0.100 GHz

b. Set signal generator for an unmodulated 100 MHz output at approximately 0 dBm.

Reference Level Variation (10 dB Steps) in Log Mode:

c. Connect equipment as shown in Figure 4-12 using 10 dB/step attenuator. Set step attenuator at 0 dB and adjust spectrum analyzer TUNING control to center signal on CRT. Set VIDEO FILTER to .01.

d. Adjust signal generator output level to place peak of trace at top graticule line. Set spectrum analyzer AMPLITUDE SCALE to 1 dB(LOG/DIV). Set FREQUENCY SPAN/DIV to 10 kHz. Pull to uncouple and set RESOLUTION BW to 10 kHz. Center signal on CRT.

e. Adjust signal generator output level or spectrum analyzer REF LEVEL FINE control until peak of trace is at sixth division (from bottom graticule line). Set the 8565A REF LEVEL control and step attenuator to settings indicated in Table 4-6. Record deviation from the sixth division reference for each setting.

Table 4-6. Reference Level Variation (10 dB steps) in Log Mode

REF LEVEL Setting (dBm)	Step Attenuator Setting (dB)	Deviation from 6th Division (dB)	Step Attenuator Error (Calibration)* (dB)	Corrected Deviation (dB)
0	0	0 (Ref.)	Ref.	0 (Ref.)
−10	10			
−20	20			
−30	30			
−40	40			
−50	50			
−60	60			
−70	70			
−80**	80			
−90**	90			

*Attenuations > dial settings are positive (+). Attenuations < dial settings are negative (−). For example 9.99 dB calibration for a 10 dB attenuator setting represents an error of −0.01 dB.
**Set VIDEO FILTER to .003 for maximum noise averaging.

4-16. REFERENCE LEVEL VARIATION TEST (Cont'd)

f. To compute the corrected deviation, add the step attenuator error to the deviation from 6th division for each setting. The corrected deviation should not exceed +0.5 dB or −0.5 dB from 0 to −70 dBm, and should not exceed +1.0 dB or −1.0 dB from 0 to −90 dBm.

Reference Level Variation (10 dB Steps) in Linear Mode:

g. Set spectrum analyzer AMPLITUDE SCALE to LIN. Set REF LEVEL control to 0 dBm and set step attenuator to 0 dB.

h. Adjust signal generator output level and spectrum analyzer REF LEVEL FINE control until peak of trace is at sixth division. Set the 8565A REF LEVEL control and step attenuator to settings indicated in Table 4-7. Record deviation from sixth division reference for each setting.

i. Using Table 4-8, convert deviation from 6th division in LIN to deviation from 6th division in dB for each setting. Record dB values in Table 4-7.

j. To compute the corrected deviation, add the step attenuator error to the deviation from 6th division in dB. The corrected deviation should not exceed +0.5 dB or −0.5 dB from 0 to −70 dBm, and should not exceed +1.0 dB or −1.0 dB from 0 to −90 dBm.

Table 4-7. Reference Level Variation (10 dB Steps) in Linear Mode

REF LEVEL Setting (dBm)	Step Attenuator Setting (dB)	Deviation from 6th Division in Linear Mode (div.)	Deviation from 6th Division in dB*	Step Attenuator Error (Calibration)** (dB)	Corrected Deviation (dB)
0	0	0 (Ref.)	0 (Ref.)	Ref.	0 (Ref.)
−10	10	_____	_____	_____	_____
−20	20	_____	_____	_____	_____
−30	30	_____	_____	_____	_____
−40	40	_____	_____	_____	_____
−50	50	_____	_____	_____	_____
−60	60	_____	_____	_____	_____
−70	70	_____	_____	_____	_____
−80	80	_____	_____	_____	_____
−90	90	_____	_____	_____	_____

*Use Table 4-8 to convert deviation in linear mode to deviation in dB.
**Attenuations > dial settings are positive (+). Attenuations < dial settings are negative(−).

4-16. REFERENCE LEVEL VARIATION TEST (Cont'd)

Table 4-8. Conversions from Deviation in Linear Mode to Deviation in dB

POSITIVE DEVIATIONS (Above 6th division from graticule baseline)		NEGATIVE DEVIATIONS (Below 6th division from graticule baseline)	
Linear (divisions)	dB	Linear (divisions)	dB
0	0	0	0
+ .1	+0.14	– .1	–0.15
+ .2	+0.28	– .2	–0.29
+ .3	+0.42	– .3	–0.45
+ .4	+0.56	– .4	–0.60
+ .5	+0.70	– .5	–0.76
+ .6	+0.82	– .6	–0.92
+ .7	+0.96	– .7	–1.08
+ .8	+1.09	– .8	–1.24
+ .9	+1.21	– .9	–1.41
+1.0	+1.34	–1.0	–1.58
+1.1	+1.46	–1.1	–1.76
+1.2	+1.58	–1.2	–1.94
+1.3	+1.70		
+1.4	+1.82		
+1.5	+1.94		

Reference Level Fine (Vernier) variation:

k. Replace 10 dB/step attenuator with 1 dB/step attenuator. Set step attenuator to 0 dB. Set spectrum analyzer REF LEVEL control to 0 dBm, REF LEVEL FINE control to 0, AMPLITUDE SCALE to 1 dB (LOG/DIV), and VIDEO FILTER to OFF.

l. Adjust signal generator output level until peak of trace is at sixth division. Set step attenuator and REF LEVEL FINE control to settings indicated in Table 4-9. Record the deviation from the sixth division for each setting.

m. To compute the corrected deviation, add the step attenuator error to the deviation from 6th division for each setting. The corrected deviation should not exceed +0.5 dB or –0.5 dB.

4-16. REFERENCE LEVEL VARIATION TEST (Cont'd)

Table 4-9. Reference Level Fine (Vernier) Variation

Step Attenuator Setting (dB)	REF LEVEL FINE Setting	Deviation from 6th Division (dB)	Step Attenuator Error (Calibration)* (dB)	Corrected Deviation (dB)
0	0	0 (Ref.)	Ref.	0 (Ref.)
1	−1			
2	−2			
3	−3			
4	−4			
5	−5			
6	−6			
7	−7			
8	−8			
9	−9			
10	−10			
11	−11			
12	−12			

*Attenuations >dial settings are positive (+). Attenuations <dial settings are negative (−).

4-17. GAIN COMPRESSION TEST

SPECIFICATION:

For signal levels below MAXIMUM input setting, gain compression is less than 1 dB.

DESCRIPTION:

Gain compression is checked by changing the input signal from 10 dB less than the MAXIMUM input setting, to the level of the MAXIMUM input setting. The signal will compress (indicate less than a 10 dB change in signal level). The amount of compression must be less than 1 dB.

4-17. GAIN COMPRESSION TEST (Cont'd)

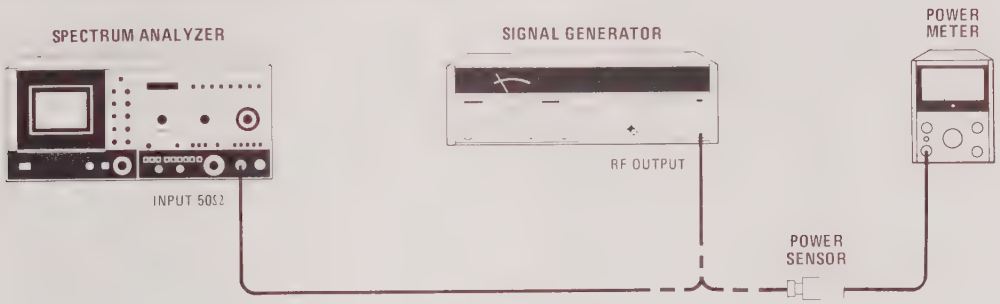


Figure 4-13. Gain Compression Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Power Meter	HP 435A
Power Sensor	HP 8481A

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	20 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	Coupled (pushed in)
FREQUENCY SPAN/DIV	.2 MHz
TUNING	0.100 GHz

b. Set signal generator for an unmodulated 100 MHz output at −14 dBm. Adjust spectrum analyzer TUNING control to center signal on CRT.

c. Set FREQUENCY SPAN/DIV to 1 MHz keeping signal centered with FINE TUNING control. Pull to uncouple and set RESOLUTION BW to 1 MHz.

d. Set AMPLITUDE SCALE to 2 dB (LOG/DIV). Center signal on CRT and adjust REF LEVEL FINE control to place peak of signal at next to bottom graticule line.

e. Set INPUT ATTEN to 0 dB and REF LEVEL to 0 dBm. Record deviation of signal from next to bottom graticule line. _____ division error

f. Set signal generator to 0 dBm using power meter.

g. Set spectrum analyzer INPUT ATTEN to 20 dB and REF LEVEL to 0 dBm. Reconnect signal to INPUT 50Ω and adjust REF LEVEL CAL to position signal at top graticule line.

h. Set INPUT ATTEN to 0 dB and REF LEVEL to 0 dBm. Record deviation from top graticule line. _____division

i. Use error recorded in step e to correct the deviation recorded in step h. Corrected deviation (gain compression) should not exceed −0.5 division (1 dB).

4-18. INPUT ATTENUATOR ACCURACY TEST

SPECIFICATION:

Input Attenuator (at preselector input, 70 dB range in 10 dB steps):

Step size variation (for steps from 0 to 60 dB):
< ±1.0 dB .01 to 18 GHz

Maximum cumulative error (from 0 to 60 dB):
< ±2.4 dB .01 to 18 GHz

DESCRIPTION:

The input attenuator accuracy is tested at 100 MHz using RF substitution (external, calibrated attenuator). The accurcy is also checked at 18 GHz using IF substitution. The IF gain reference level variation, previously recorded in Table 4-6, is taken into account when measuring attenuator accuracy at 18 GHz.

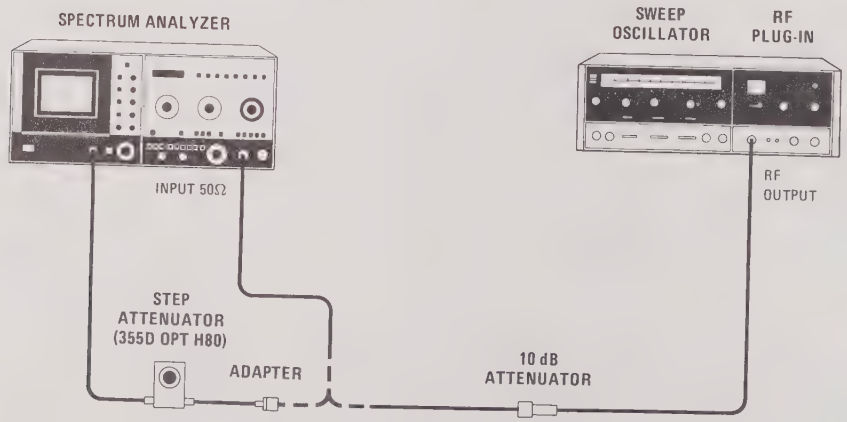


Figure 4-14. Input Attenuator Accuracy Test Setup

EQUIPMENT:

Sweep Oscillator/RF Plug-in	HP 8620C/86290A
Step Attenuator (10 dB/step)	HP 355D Opt. H80
10 dB Attenuator	HP 8491B, Opt. 010
Adapter, Type N Male to BNC Female	HP 1250-0780

4-18. INPUT ATTENUATOR ACCURACY TEST (Cont'd)

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... .01 — 1.8
INPUT ATTEN ..... 60 dB
REF LEVEL ..... 0 dBm
RESOLUTION BW ..... Coupled (pushed in)
FREQUENCY SPAN/DIV ..... .2 MHz
TUNING ..... 0.100 GHz

b. Connect equipment as shown in Figure 4-14 using CAL OUTPUT signal and step attenuator. Set step attenuator to 0 dB. Adjust spectrum analyzer TUNING control to center signal on CRT.

c. Pull to uncouple and set FREQUENCY SPAN/DIV to 10 kHz keeping signal centered with FINE TUNING control. Set RESOLUTION BW to 10 kHz.

d. Set AMPLITUDE SCALE to 1 dB (LOG/DIV) and set VIDEO FILTER to .01. Adjust REF LEVEL FINE control to place peak of signal at sixth division (from bottom graticule line).

e. Set the 8565A INPUT ATTEN (push in to set) and step attenuator to settings indicated in Table 4-10. Record deviation from sixth division for each setting.

Table 4-10. Input Attenuator Accuracy, 100 MHz

INPUT ATTEN Setting (dB)	Step Attenuator Setting (dB)	Deviation from 6th Division (dB)	Step Attenuator Error (Calibration)*	INPUT ATTEN Corrected Deviation (dB)
70	0	0 (Ref.)	Ref.	0 (Ref.)
60	10	_____	_____	_____
50	20	_____	_____	_____
40	30	_____	_____	_____
30	40	_____	_____	_____
20	50	_____	_____	_____
10	60	_____	_____	_____
0	70	_____	_____	_____

*Attenuations > dial settings are positive (+). Attenuations < dial settings are negative (−). For example, 9.99 dB calibration for a 10 dB attenuator setting represents an error of −0.01 dB.

f. To compute the corrected deviation, add the step attenuator error to the deviation from 6th division for each setting. The corrected deviation should not exceed ±1.0 dB between any two adjacent settings of the input attenuator.

4-18. INPUT ATTENUATOR ACCURACY TEST (Cont'd)

g. Record the maximum positive and maximum negative corrected deviation values computed in Table 4-10. The difference between these two values (total deviation) should not exceed ±2.4 dB.

_____ dB Max Pos. Corrected Deviation
_____ dB Max Neg. Corrected Deviation
_____ dB Max Cumulative Error (Total Deviation)

h. Disconnect step attenuator from spectrum analyzer input and connect sweep oscillator output through 10 dB attenuator as shown in Figure 4-14.

i. Set spectrum analyzer to Normal Settings. Set INPUT ATTEN to 0 dB and set REF LEVEL to 0 dBm. Set FREQUENCY BAND GHz to 8.5 — 18. Set FREQUENCY SPAN/DIV (coupled) to 2 MHz and adjust TUNING control for an indication of 18.0 GHz on FREQUENCY readout.

j. Set sweep oscillator for a 18.0 GHz CW signal with maximum internally leveled output power. Adjust sweep oscillator CW and CW vernier controls to center signal on CRT display.

k. Set AMPLITUDE SCALE to 1 dB (LOG/DIV) and adjust REF LEVEL FINE control to place peak of signal at sixth division (from bottom graticule line). Reduce sweep oscillator power if necessary.

l. Press ZERO SPAN Pushbutton and set VIDEO FILTER to NOISE AVG. Adjust FINE TUNING control to peak trace on CRT display and adjust REF LEVEL FINE control to place trace at sixth division.

m. Set INPUT ATTEN to 10 dB and return REF LEVEL control to 0 dBm. Do not adjust REF LEVEL FINE control.

n. Adjust FINE TUNING control to peak trace and record deviation from 6th division in Table 4-11.

o. Set INPUT ATTEN to 20 dB and return REF LEVEL control to 0 dBm. Do not adjust REF LEVEL FINE control. Repeat step n.

p. Set INPUT ATTEN to 30 dB and return REF LEVEL control to 0 dBm. Do not adjust REF LEVEL FINE control. Repeat step n.

q. Remove 10 dB attenuator and connect cable from sweep oscillator output directly to analyzer input. Set REF LEVEL control to +10 dBm. Adjust FINE TUNING control to peak trace and adjust REF LEVEL FINE control to place trace at deviation recorded for 30 dB INPUT ATTEN setting.

r. Set INPUT ATTEN to 40 dB and return REF LEVEL control to +10 dBm. Do not adjust REF LEVEL FINE control. Repeat step n.

s. Set INPUT ATTEN to 50 dB and return REF LEVEL control to +10 dBm. Do not adjust REF LEVEL FINE control. Repeat step n.

t. Set INPUT ATTEN to 60 dB and return REF LEVEL control to +10 dBm. Do not adjust REF LEVEL FINE control. Repeat step n.

4-18. INPUT ATTENUATOR ACCURACY TEST (Cont'd)

Table 4-11. Input Attenuator Accuracy, 18 GHz

INPUT ATTEN Setting (dB)	Deviation from 6th Division (dB)	REF LEVEL Corrected Deviation* (dB)		INPUT ATTEN Corrected Deviation (dB)
0	0 (Ref.)	0 (Ref.)	(0)	0 (Ref.)
10	_____	_____	(−10)	_____
20	_____	_____	(−20)	_____
30	_____	_____	(−30)	_____
40	_____	_____	(−30)	_____
50	_____	_____	(−40)	_____
60	_____	_____	(−50)	_____

*From Table 4-6.

u. Record REF LEVEL corrected deviation from Table 4-6 in Table 4-11. (Note that REF LEVEL corrected deviation for INPUT ATTEN setings of 30 dB and 40 dB are the same.)

v. To compute the corrected deviation, subtract the REF LEVEL corrected deviation from the deviation from the 6th division for each setting (see example). The corrected deviation should not exceed ±1.0 dB between any two adjacent settings of the input attenuator.

Example:

INPUT ATTEN Setting (dB)	Deviation from 6th Division (dB)	REF LEVEL Corrected Deviation* (dB)		Corrected Deviation (dB)
0	0 (Ref.)	0 (Ref.)	(0)	0 (Ref.)
10	−0.1	−0.2	(−10)	+0.1
20	+0.3	−0.1	(−20)	+0.4
30	−0.2	+0.1	(−30)	−0.3
40	+0.2	+0.1	(−30)	+0.1

w. Record the maximum positive and maximum negative corrected deviation values computed in Table 4-11. The difference between these two values should not exceed ±2.4 dB.

_____ dB Max Pos. Corrected Deviation
_____ dB Max Neg. Corrected Deviation
_____ dB Max Cumulative Error (Total Deviation)

4-19. CALIBRATOR OUTPUT ACCURACY TEST

SPECIFICATION:

Calibrator output:
−10 dBm ± 0.3 dB
100 MHz ± 10 kHz

DESCRIPTION:

The calibrator output level is measured using a power meter. The frequency of the calibrator output signal is measured using the counter input of the HP 8640B.

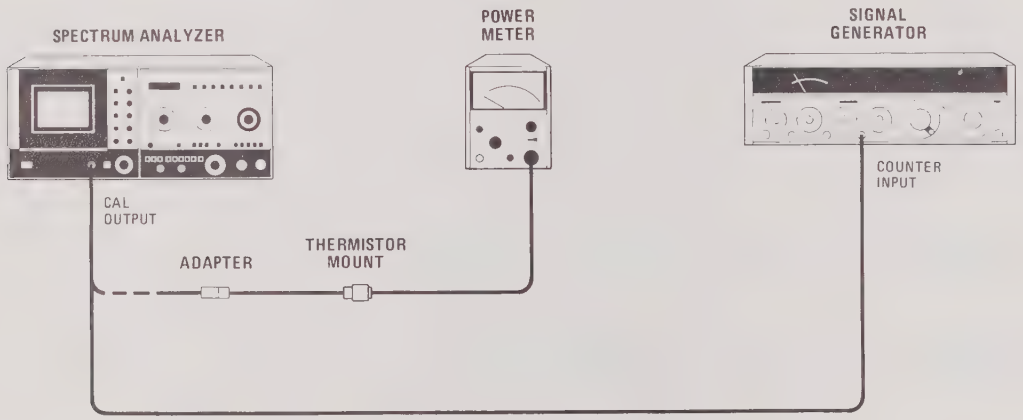


Figure 4-15. Calibrator Output Accuracy Test Setup

EQUIPMENT:

Power Meter	HP 432A
Thermistor Mount	HP 8478B
Signal Generator	HP 8640B
Adapter, Type N Female to BNC Male	HP 1250-0077

PROCEDURE:

a. Zero and calibrate the power meter. Connect thermistor mount, through adapter, directly to CAL OUTPUT port and measure power level. Calibrator output level should be −10 dBm ±0.3 dB.

b. Disconnect thermistor mount/adapter and connect CAL OUTPUT to counter input of HP 8640B. Set counter mode to expand X10 and external. Calibrator output frequency should be 100 MHz ± 10 kHz.

4-20. FREQUENCY RESPONSE TEST

SPECIFICATION:

Frequency Response (with 0 or 10 dB of Input Attenuation): Frequency response includes input attenuator, preselector and mixer response plus mixing mode gain variation (band to band).

DESCRIPTION:

Frequency response is checked in each internal mixing band. The spectrum analyzer is internally swept in FULL BAND mode and the RF input signal is very slowly swept across the entire FREQUENCY BAND selected. The resulting display is a "picket fence" which varies in heighth across the CRT. Since the RF source is leveled and held quite flat across each frequency band, variations in amplitude on the display represent the frequency response of the spectrum analyzer. The 10.5 to 22 GHz FREQUENCY BAND requires two different test setups but is performed in the same manner. Since leveling within reasonable limits becomes difficult from 18 GHz to 22 GHz, the RF output at the power splitter is characterized and compensated for when making the measurement from 18 GHz to 22 GHz.

CONFIGURATION A

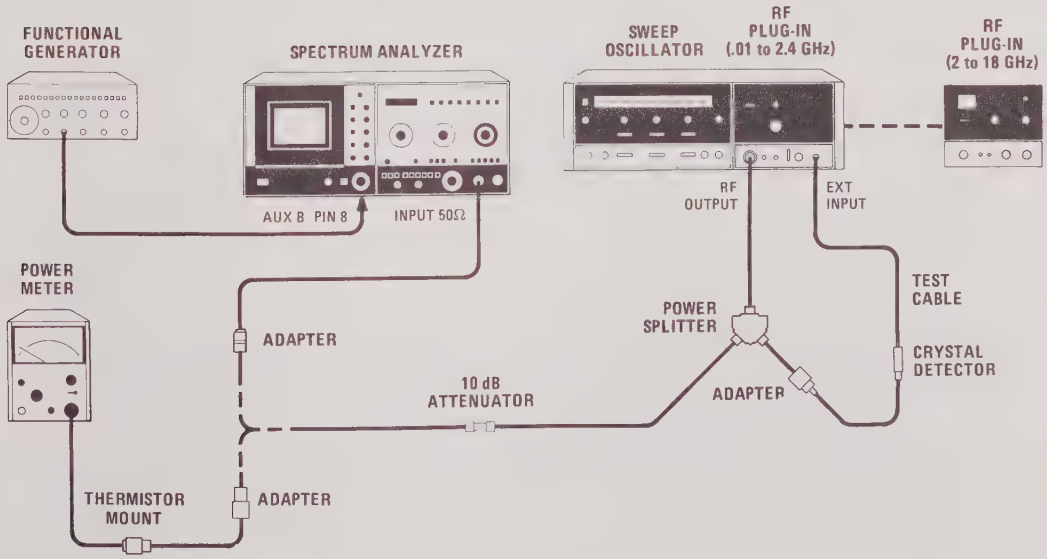


Figure 4-16. Frequency Response Test Setup (1 of 2)

4-20. FREQUENCY RESPONSE TEST (Cont'd)

CONFIGURATION B

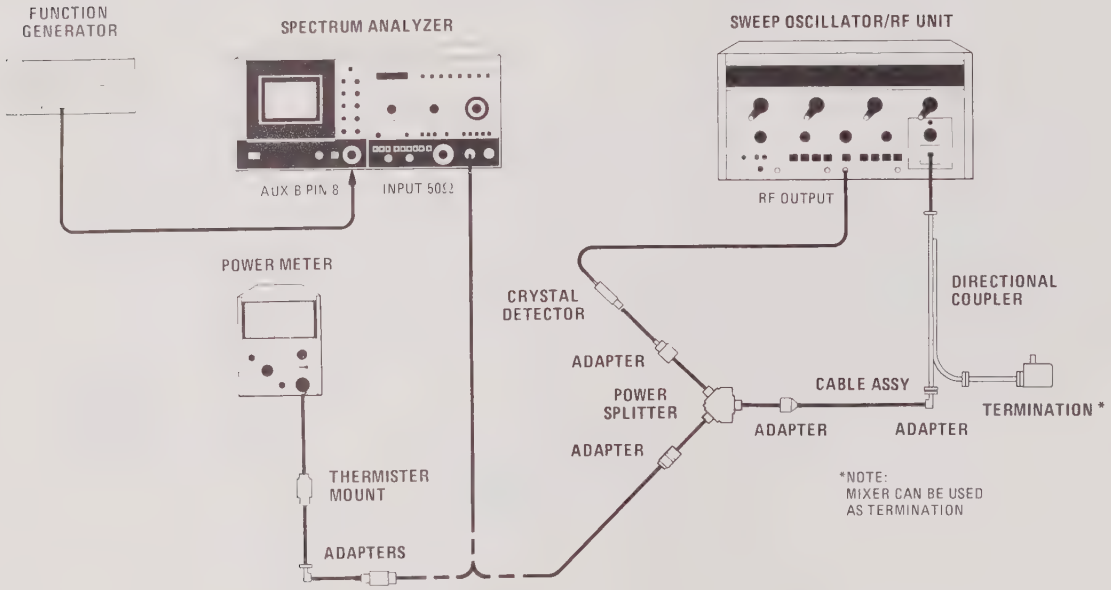


Figure 4-16. Frequency Response Test Setup (2 of 2)

EQUIPMENT:

Sweep Oscillator	HP 8620C/86222A/86290A
Sweep Oscillator/RF Unit	HP 8690B/8696A
Power Meter	HP 432A
Thermistor Mount	HP K486A
Thermistor Mount	8478B
Power Splitter	HP 11667A Opt. 002
Crystal Detector	HP 33330C
10 dB Attenuator	HP 8492A
Test Cable, SMA Female to BNC Male (Part of Service Package, HP P/N 08565-60100)	HP 11592-60001
Adapter, APC-7 to Type N Male	HP 11525A
Adapter, APC-7 to Type N Female	HP 11524A
Adapter, APC-7 to SMA Female	HP 11534A
Adapter, Waveguide to SMA Jack (2 required)	Narda 4608
Adapter, N Plug/SMA Jack	HP 1250-1250
Adapter, Type N Female to SMA Female	HP 86290-60005
Cable Assembly	HP 8120-1578
Function Generator	HP 3312A

4-20. FREQUENCY RESPONSE TEST (Cont'd)

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	0 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	3 MHz, Uncoupled
FREQUENCY SPAN/DIV	2 MHz
TUNING	0.100 GHz
AMPLITUDE SCALE	.2 dB LOG/DIV

Frequency Response, .01 to 18 GHz Bands

b. Using .01 to 2.4 GHz source, connect equipment as shown in Configuration A of Figure 4-16. Connect output of power splitter, through 10 dB attenuator and adapter, to thermistor mount. With RF power off, zero the power meter. Turn RF power on.

c. Set sweep oscillator for 100 MHz and adjust RF power level for a power meter indiction of −8 dBm. Connect output of power splitter through 10 dB attenuator and adapter directly (do not use cable) to INPUT 50Ω of spectrum analyzer. Peak of signal should be at center horizontal graticule line ± one minor division (±0.3 dB). If not, recheck sweep oscillator output level making sure that power meter has been properly calibrated and zeroed before making the measurement.

d. Adjust REF LEVEL CAL to place peak of 100 MHz signal at center horizontal graticule line.

e. Set spectrum analyzer FREQUENCY SPAN MODE to FULL BAND and set TUNING control fully counterclockwise (lowest frequency). Set BASELINE CLIPPER to 12 o'clock position. Set sweep oscillator to cover entire FREQUENCY BAND selected.

NOTE

To properly set band edges using HP 8620C, use marker sweep and set sweep oscillator to manual sweep mode. Set manual sweep control fully counterclockwise and adjust start marker control until signal is at left-hand edge of spectrum analyzer display. Set sweep oscillator manual sweep control fully clockwise and adjust stop marker until signal is at right-hand edge of spectrum analyzer display.

f. Set spectrum analyzer PERSIST control fully clockwise. Set sweep oscillator for automatic internal sweep at slowest sweep time (100 seconds). Slowly adjust sweep oscillator sweep time vernier for display similar to that of Figure 4-17. Read greatest positive and greatest negative deviations from center horizontal graticule line. Frequency response (deviation from center horizontal graticule line) should not exceed ± 1.2 dB.

4-20. FREQUENCY RESPONSE TEST (Cont'd)

NOTE

If the frequency response appears to be out of specification near a band edge, use a frequency counter to ensure the frequency in question is within the specified band. This may be necessary as the FULL BAND mode frequency span is slightly beyond the specified band edges.

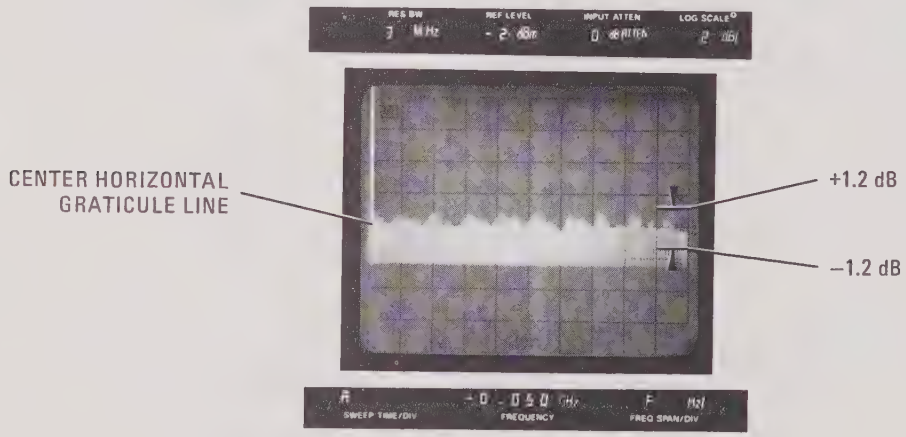


Figure 4-17. Typical Frequency Response, .01 to 1.8 GHz

g. Set spectrum analyzer INPUT ATTEN control to 10 dB and set REF LEVEL control to 0 dBm. Press ERASE pushbutton. Record level with respect to center horizontal graticule line at 100 MHz. This level is the reference for frequency response measurements with 10 dB INPUT ATTENuation. Read greatest positive and negative deviations from the 100 MHz reference. Frequency response should not exceed ±1.2 dB.

100 MHz Reference _____dB from center horizontal graticule line

h. Remove .01 to 2.4 GHz RF plug-in from mainframe and replace with 2 to 18 GHz RF plug-in. Remove 10 dB attenuator and connect power splitter directly to spectrum analyzer INPUT 50Ω. Select band 4 (2.0 – 18 GHz) on 8620C sweep oscillator.

i. Set spectrum analyzer INPUT ATTEN control to 0 dB, REF LEVEL control to 0 dBm, and FREQUENCY BAND GHz to 1.7 — 4.1. Set PERSIST control fully counterclockwise. Set sweep oscillator to CW mode and adjust CW control to center signal on CRT CENTER FREQUENCY line. Set sweep oscillator to ΔF x 10. Set mode switch to manual sweep and set manual sweep control fully counterclockwise. Adjust ΔF control until signal is at left-hand edge of CRT display. Set manual sweep control fully clockwise. Signal should be at right-hand edge of CRT display. If necessary, readjust ΔF and CW controls slightly to cover entire FREQUENCY BAND (1.7 to 4.1 GHz).

4-20. FREQUENCY RESPONSE TEST (Cont'd)

j. Set PRESELECTOR PEAK control to center of green region. Apply a 1 kHz 1V peak-to-peak sine wave from a function generator to AUX B pin 8. This signal modulates the YTF (YIG tuned filter) and is equivalent to peaking the PRESELECTOR PEAK at all frequencies.

k. Disconnect power splitter from spectrum analyzer input and measure output at power splitter port with power meter. Slowly tune through the entire frequency band using the sweep oscillator manual sweep control. Note the maximum and minimum excursions and set manual sweep control for a power meter indication midway between the maximum and minimum excursions. Turn RF power off and zero the power meter. Turn RF power on and adjust RF plug-in power level control for a power meter indication of −8 dBm. Reconnect power splitter to spectrum analyzer input.

l. Set spectrum analyzer PERSIST control fully clockwise. Set sweep oscillator mode switch to automatic sweep and press spectrum analyzer ERASE pushbutton. Read greatest positive and negative deviations from center horizontal graticule line. Frequency response should not exceed ±1.7 dB.

m. Set spectrum analyzer INPUT ATTEN control to 10 dB and set REF LEVEL control to 0 dBm. Press ERASE pushbutton. Read greatest positive and negative deviations from 100 MHz reference (step g). Frequency response should not exceed ±1.7 dB.

n. Set spectrum analyzer INPUT ATTEN control to 0 dB, REF LEVEL control to 0 dBm, and FREQUENCY BAND GHz to 3.8 — 8.5. Set PERSIST control fully counterclockwise. Set sweep oscillator mode switch to manual and set controls to cover entire FREQUENCY BAND selected (refer to note in step e). Repeat steps k through l. Frequency response should not exceed ±2.2 dB.

o. Set spectrum analyzer INPUT ATTEN control to 10 dB and set REF LEVEL control to 0 dBm. Press ERASE pushbutton. Read greatest positive and negative deviations from 100 MHz reference (step g).

p. Set spectrum analyzer INPUT ATTEN control to 0 dB, REF LEVEL control to 0 dBm, and FREQUENCY BAND GHz to 5.8 — 12.9. Set PERSIST control fully counterclockwise. Set sweep oscillator mode switch to manual sweep and set controls to cover entire FREQUENCY BAND selected (refer to note in step e). Repeat steps k through l. Frequency response should not exceed ±2.5 dB. Repeat step o. Frequency response should not exceed ±2.5 dB.

q. Set spectrum analyzer INPUT ATTEN control to 0 dB, REF LEVEL control to 0 dBm, and FREQUENCY BAND GHz to 8.5 — 18. Set PERSIST control fully counterclockwise. Set sweep oscillator mode switch to manual sweep and set controls to cover entire FREQUENCY BAND selected (refer to note in step e). Repeat steps k through l. Frequency response should not exceed ±3.0 dB. Repeat step o. Frequency response should not exceed ±3.0 dB.

Frequency Response, 10.5 to 22 GHz Band

r. With INPUT ATTEN control set at 10 dB and REF LEVEL control set at 0 dBm, set spectrum analyzer FREQUENCY BAND GHz to 10.5 — 22. Set PERSIST control fully counterclockwise. Set BASELINE CLIPPER Fully counterclockwise. Set sweep oscillator mode switch to manual and set controls to cover 10.5 to 18 GHz.

4-20. FREQUENCY RESPONSE TEST (Cont'd)

s. Disconnect power splitter from spectrum analyzer input and measure output at power splitter with power meter. Set sweep oscillator to 18 GHz (manual sweep control fully clockwise) and adjust RF plug-in power level control for a power meter indication of −8 dBm. Reconnect power splitter to spectrum analyzer input.

t. Set spectrum analyzer PERSIST control fully clockwise. Set sweep oscillator mode switch to automatic sweep and press spectrum analyzer ERASE pushbutton. STORE display after one full plot as shown in Figure 4-18. Record the greatest positive and negative deviations from center horizontal graticule line.

_____ Pos. Deviation

_____ Neg. Deviation

u. Connect equipment as shown in Configuration B of Figure 4-16 with power meter connected to measure output of power splitter. Set sweep oscillator for CW output at 18 GHz. Set line switch to standby and zero the power meter. Turn RF on and set output of sweep oscillator to −8 dBm. Slowly tune the CW source from 18 GHz to 22 GHz and note all of the peak deviations (positive and negative) from −8 dBm reference, and frequencies at which they occur. Record frequencies and peak deviations in Table 4-12. (See example.)

Table 4-12. Correcting for Frequency Response of Signal Source

Frequency (GHz)	Peak Deviation (dB)	CRT Horizontal Displacement (div)	Actual Deviation (dB)	Corrected Deviation (dB)

Example:

Frequency (GHz)	Peak Deviation (dB)	CRT Horizontal Displacement (div)	Actual Deviation (dB)	Corrected Deviation (dB)
18.6	− 1.0	7	− 1.0	0
19.6	− 0.5	7.8	− 1.0	− 0.5
20.1	+ 1.0	8.3	0	− 1.0
20.6	− 1.5	8.7	− 2.0	− 0.5
21.2	+ 0.5	9.2	+ 1.5	+ 1.0
21.8	− 1.0	9.7	− 0.4	+ 0.6

4-20. FREQUENCY RESPONSE TEST (Cont'd)

v. Disconnect thermistor mount from power splitter and connect measured port of power splitter to spectrum analyzer INPUT 50Ω.

w. Set AMPLITUDE SCALE to 10 dB (LOG/DIV). Set TUNING control to each frequency recorded in Table 4-12 and record CRT Horizontal Displacement of marker (number of divisions from far left graticule line) for each setting. (See example.)

x. Set AMPLITUDE SCALE to 2 dB (LOG/DIV). Set TUNING control for any frequency less than 18 GHz. Set sweep oscillator to manually triggered sweep function and adjust band edges to cover 18 GHz to 22 GHz. Set sweep time for slowest sweep (100 seconds).

y. Press spectrum analyzer ERASE pushbutton and set PERSIST control fully clockwise. Trigger the sweep oscillator and slowly adjust sweep time vernier for display similar to that of Figure 4-19. STORE display and read greatest positive and negative deviations from center horizontal graticule line.

——— Pos. Deviation

——— Neg. Deviation

z. Read deviation from horizontal graticule line at each CRT Horizontal Displacement and record Actual Deviations in Table 4-12. Algebraically subtract Peak Deviation from CRT Actual Deviation for each setting in Table 4-12. Record results in Corrected Deviation column. (See example.) Including results from steps t and y and Corrected Deviation from Table 4-12, record the greatest positive and negative deviations. Frequency response (deviation from center horizontal graticule line) should not exceed ± 4.5 dB.

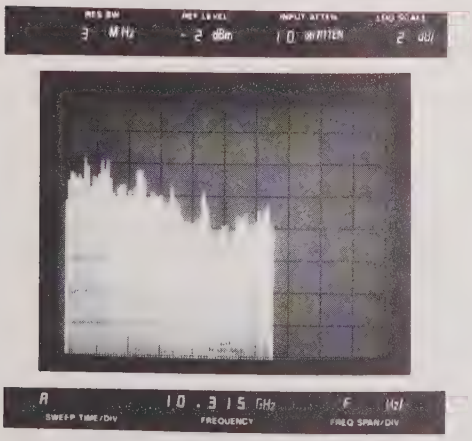


Figure 4-18. Typical Frequency Response, 10.5 to 18 GHz

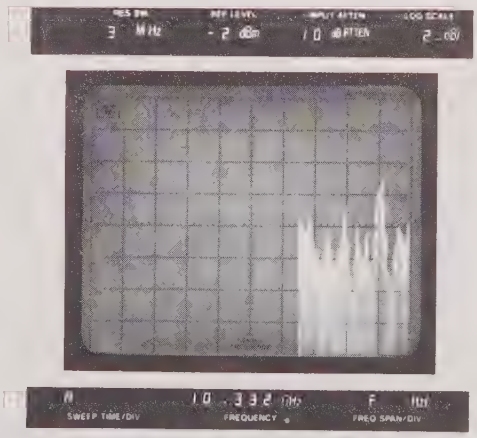


Figure 4-19. Typical Frequency Response, 18 to 22 GHz.

PERFORMANCE TESTS

4-21. AMPLITUDE ACCURACY SWITCHING BETWEEN BANDWIDTHS TEST

SPECIFICATION:

Switching between bandwidths: 3 MHz to 300 kHz, ±0.5 dB; 3 MHz to 1 kHz (3 MHz to .1 kHz for Option 100), ±1.0 dB (100 kHz BW limited to 90% relative humidity).

DESCRIPTION:

The spectrum analyzer 100 MHz CAL OUTPUT signal is applied to the INPUT 50Ω and displayed on the CRT. The peak of the displayed 100 MHz signal is centered on the CRT and adjusted for a vertical deflection of seven divisions. The amplitude variation of the 100 MHz signal is measured for each RESOLUTION BW control setting.

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	−8
RESOLUTION BW	1 MHz, Uncoupled
FREQUENCY SPAN/DIV	.2 MHz
TUNING	0.100 GHz

b. Connect spectrum analyzer CAL OUTPUT signal to INPUT 50Ω.

c. Set AMPLITUDE SCALE to 1 dB (LOG/DIV) and center signal on CRT.

d. Adjust REF LEVEL FINE control to position peak of 100 MHz signal at seventh division (from bottom graticule line).

e. Change the RESOLUTION BW and FREQUENCY SPAN/DIV controls in accordance with Table 4-13. Record the change in amplitude for each RESOLUTION BW setting. Changes in amplitude above reference level set in step d are positive (+). Changes below reference level are negative (−).

f. To find the overall variation in Table 4-13, algebraically subtract the greatest negative change in amplitude from the greatest positive change in amplitude. If all changes in amplitude are of the same sign, the overall variation is the largest positive or largest negative change in amplitude. The overall variation between 3 MHz and 300 kHz RESOLUTION BW settings should be ≤1.0 dB (±0.5 dB). The overall variation between 3 MHz and 1 kHz (3 MHz and .1 kHz for Option 100) RESOLUTION BW settings should be ≤2.0 dB (±1.0 dB).

4-21. AMPLITUDE ACCURACY SWITCHING BETWEEN BANDWIDTHS TEST (Cont'd)

Table 4-13. Amplitude Accuracy Switching Between Bandwidths

RESOLUTION BW Setting	FREQUENCY SPAN/DIV Setting	Change in Amplitude (dB)	Overall Variation Between 3 MHz and 300 kHz RESOLUTION BW Settings	Overall Variation Between 3 MHz and 1 kHz RESOLUTION BW Settings
3 MHz	1 MHz	0 (Ref.)		
1 MHz	.2 MHz	_____	_____	_____
300 kHz	50 kHz	_____		
100 kHz	20 kHz	_____		
30 kHz	5 kHz	_____		
10 kHz	2 kHz	_____		
3 kHz	2 kHz	_____		
1 kHz	1 kHz	_____		
Opt. 100 .3 kHz	1 kHz	_____		
Opt. 100 .1 kHz	1 kHz	_____		

4-22. DISPLAY ACCURACY TEST

SPECIFICATION:

Display accuracy:
Log: $< \pm 0.1$ dB/dB but not more than ± 1.5 dB over full 70 dB display range.
Linear: $< \pm 0.1$ division over full 8 division deflection.

DESCRIPTION:

The display accuracy is tested by connecting a DVM to the rear-panel VERTICAL OUTPUT connector of the spectrum analyzer. ZERO SPAN mode is selected so the signal appears as a straight horizontal line on the CRT display. The DVM is used to provide good resolution for this measurement.

4-22. DISPLAY ACCURACY TEST (Cont'd)

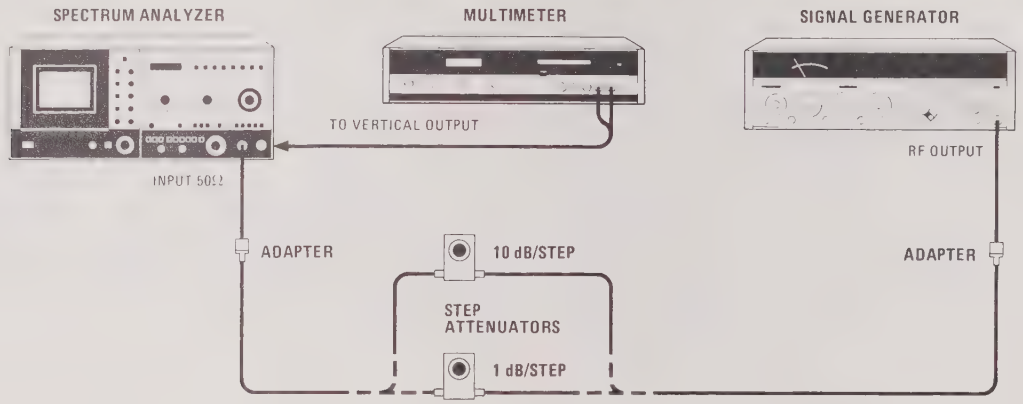


Figure 4-20. Display Accuracy Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Multimeter (DVM)	HP 3490A
Step Attenuator (10 dB/Step)	HP 355D
Step Attenuator (1 dB/Step)	HP 355C
Adapter, Type N Male to BNC Female (2 required)	HP 1250-0780

PROCEDURE:

a. Set spectrum analyer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	Coupled (pushed in)
FREQUENCY SPAN/DIV	2 MHz
TUNING	0.030 GHz
AMPLITUDE SCALE	LIN

Log Display Accuracy

b. With no signal at INPUT, measure and record the VERTICAL OUTPUT offset of the spectrum analyzer.

_____ mV

c. Connect equipment as shown in Figure 4-20 using 10 dB/step attenuator. Set step attenuator to 0 dB. Set signal generator for an unmodulated 30 MHz output at approximately 0 dBm.

4-22. DISPLAY ACCURACY TEST (Cont'd)

d. Set spectrum analyzer AMPLITUDE SCALE to 10 dB (LOG/DIV) and adjust TUNING control to center signal on CRT. Set FREQUENCY SPAN MODE to ZERO SPAN. Adjust FINE TUNING control to peak signal on CRT and DVM. If there is not enough tuning range, turn AUTO STABILIZER OFF while using TUNING control.

e. Set spectrum analyzer REF LEVEL FINE for a DVM indication of +800 mV plus the offset (step b) ±0.5 mV. The trace should be approximately at the top graticule line.

f. Increase the attenuation of the step attenuator and record the DVM reading for each step (up to 70 dB) in Table 4-14.

Table 4-14. Log Display Accuracy

Attenuator Setting (dB)	DVM Reading (mV)	Corrected DVM Reading * (mV)	Theoretical Reading (mV)	Theoretical Reading Subtracted from DVM Reading (mV)	Difference Between Adjacent Readings (mV)
0	_____	+800 (Ref.)	+800	0	
10	_____	_____	+700	_____	_____
20	_____	_____	+600	_____	_____
30	_____	_____	+500	_____	_____
40	_____	_____	+400	_____	_____
50	_____	_____	+300	_____	_____
60	_____	_____	+200	_____	_____
70	_____	_____	+100	_____	_____

*DVM Reading minus offset recorded in step b.

Example 1 (+5mV offset)

Attenuator Setting (dB)	DVM Reading (mV)	Corrected DVM Reading * (mV)	Theoretical Reading (mV)	Theoretical Reading Subtracted From DVM Reading (mV)	Difference Between Adjacent Readings (mV)
0	+805	+800	+800	0	
10	+811	+703	+700	+3	−3
20	+599	+594	+600	-6	+9
30	+497	+492	+500	-8	+2
40	+406	+401	+400	+1	−9

4-22. DISPLAY ACCURACY TEST (Cont'd)

g. Having recorded the DVM readings for all of the attenuator settings from 0 to 70 dB, subtract the theoretical reading from the corrected DVM reading (DVM reading minus offset) in each case and record results in Table 4-14.

h. Subtract each converted reading (theoretical reading subtracted from DVM reading) from the previous converted reading. This subtraction must be performed algebraically. Record results in Table 4-14 (see Example 1).

i. The difference between adjacent readings (Table 4-14) should not exceed ±10 mV (±0.1 dB/dB).

j. Note the highest positive and negative value recorded under "Theoretical Reading Subtracted from DVM Reading." Add their absolute values (disregarding their signs). If all of the signs are negative or all of the signs are positive, subtract the lowest absolute value from the highest absolute value. (See Exmple 2). The sum or difference of the absolute values should not exceed 30 mV (±1.5 dB).

Example 2

Observing the table in Example 1, note that −8 mV is the highest negative value and +3mV is the highest positive value. Their absolute values being 8 mV and 3 mV: 8 plus 3 = 11 mV (1.1 dB).

Linear Display Accuracy

k. Replace 10 dB/step attenuator with 1 dB/step attenuator. Set step attenuator to 0 dB.

l. Set spectrum analyzer AMPLITUDE SCALE to LIN and adjust REF LEVEL FINE control for a DVM indication of +800 mV ± 0.5 mV.

m. Set step attenuator to 6 dB. DVM should indicate +400 mV ± 10 mV (±0.1 division).

n. Set step attenuator to 12 dB. DVM should indicate +200 mV ± 10 mV (± 0.1 division).

4-23. SWEEP TIME ACCURACY TEST

SPECIFICATION:

Calibrated sweep times: 21 internal sweep times from 2 μsec/Div to 10 sec/Div in 1, 2, 5, 10 sequence. Sweep time accuracy ±10% except for 2, 5, and 10 sec/Div which are ±20%.

DESCRIPTION:

A time mark generator is used to modulate a 500 MHz signal which is applied to the INPUT 50Ω of the spectrum analyzer. ZERO SPAN is used to demodulate the signal, displaying markers at very accurate time intervals. The sweep time accuracy of the spectrum analyzer is checked by observing the marker displayed near the center graticule line. This marker (peak) must be within ±0.5 division (±10%) of center graticule line for sweep times up to and including 1 second per division, and ±1.0 division (±20%) for 2, 5, and 10 second per division sweeps.

4-23. SWEEP TIME ACCURACY TEST (Cont'd)

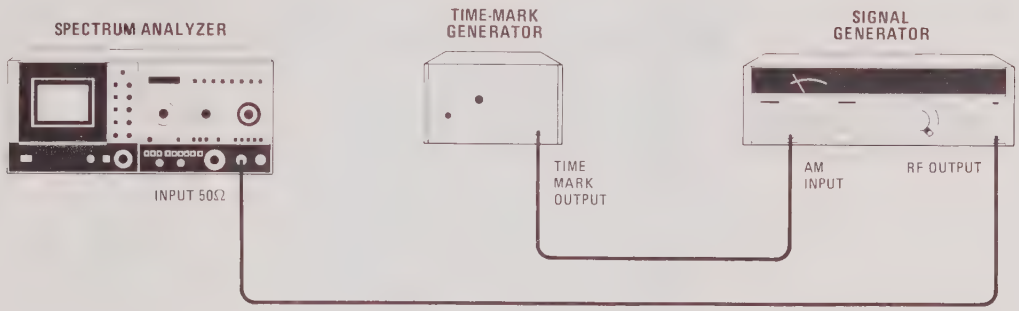


Figure 4-21. Sweep Time Accuracy Test Setup

EQUIPMENT:

Signal Generator	HP 8640B
Time Mark Generator	HP 226A

PROCEDURE:

a. Set spectrum analyzer controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	10 dB
REF LEVEL	+10 dBm
REF LEVEL FINE	0
RESOLUTION BW	3 MHz, Uncoupled
FREQUENCY SPAN/DIV	10 MHz
TUNING	0.500 GHz

b. Set signal generator for an unmodulated 500 MHz output at approximately 0 dBm.

c. Connect equipment as shown in Figure 4-21 leaving 8640B AM switch in OFF position.

d. Adjust spectrum analyzer TUNING control to center signal on CRT. Set FREQUENCY SPAN MODE to ZERO SPAN and set SWEEP TRIGGER to VIDEO.

e. Set 8640B AM switch to PULSE. Set time mark generator to 5 μsec and spectrum analyzer SWEEP TIME/DIV switch to 2 μsec.

f. Adjust TRIGGER LEVEL so the first peak is at the graticule reference line (see Figure 4-22). The third peak should be at the center graticule line ± 0.5 division (±10%).

g. Set SWEEP TIME /DIV to 5 μsec and adjust TRIGGER LEVEL so first peak is at graticule reference line. The sixth peak should be at the center grticule line ±0.5 division (±10%).

4-23. SWEEP TIME ACCURACY TEST (Cont'd)

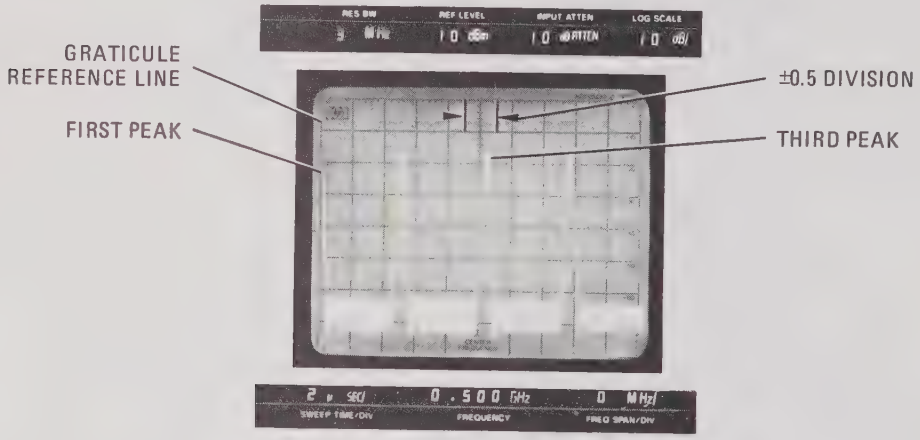


Figure 4-22. Sweep Time Accuracy, 2μ SEC/DIV

h. Continue increasing SWEEP TIME/DIV and setting time mark generator to match the sweep times of the spectrum analyzer. Adjust TRIGGER LEVEL as necessary to place first peak at graticule reference line. The sixth peak should be at center graticule line ±0.5 division for each setting up to and including 1 SEC per division.

NOTE

When 10 mSEC SWEEP TIME/DIV setting is reached, set BASELINE CLIPPER control clockwise until baseline completely disappears. Set PERSIST control fully clockwise and adjust INTENSITY control as necessary to reduce blooming. Continue checking SWEEP TIME/DIV up to and including 1 SEC per division. Press ERASE pushbutton before checking position of sixth peak for each setting. (See Figure 8-23.)

i. Continue increasing SWEEP TIME/DIV and time mark generator settings to measure sweep time accuracy at 2, 5, and 10 second per division sweeps. START/RESET pushbutton can be used to reset start of trace for each setting. The sixth peak should be at center graticule line ±1.0 division (±20%).

PERFORMANCE TESTS

4-23. SWEEP TIME ACCURACY TEST (Cont'd)

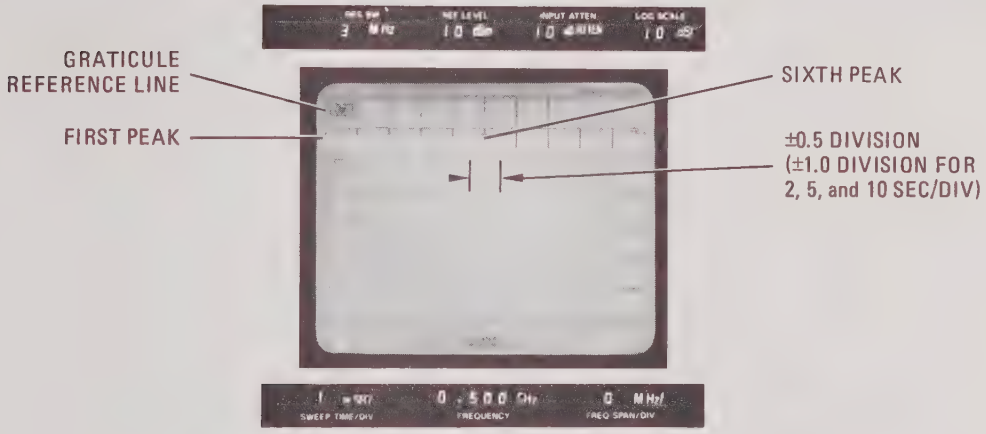


Figure 4-23. Sweep Time Accuracy, 1 mSEC/DIV

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section describes adjustments required to return the Spectrum Analyzer to peak operating condition when repairs are required. Table 5-1 lists all of the adjustments by adjustment name, reference designator, adjustment paragraph, service sheet number, and description. Included in this section are test setups, and check and adjustment procedures.

5-3. Data taken during adjustments should be recorded in the spaces provided. Comparison of initial data with data taken during periodic adjustments assists in preventive maintenance and troubleshooting.

WARNING

With the covers removed, terminals are exposed that have voltages capable of causing death. The adjustments in this section should be performed only by a skilled person who knows the hazard involved.

NOTE

Before performing any adjustments, allow 1 hour warmup time for the instrument.

5-4. EQUIPMENT REQUIRED

5-5. Table 1-3 contains a tabular list of test equipment and test accessories required in the adjustment procedures. In addition, the table contains the required minimum specifications and a suggested manufacturers model number.

5-6. Blade Tuning Tools

5-7. For adjustments requiring a non-metallic tuning tool, use fiber tuning tool, HP Part Number 8710-0033. In situations not requiring non-metallic tuning tools, an ordinary small screwdriver or other suitable tool is sufficient. No matter what tool is used, never try to force any adjustment control in the analyzer. This is especially critical when tuning variable slug-tuned inductors, and variable capacitors.

5-8. FACTORY SELECTED COMPONENTS

5-9. Table 5-2 contains a list of factory selected components by reference designation, schematic diagram location, and basis of selection. Factory selected components are designated by an asterisk (*) on the schematic diagrams in Section VIII.

5-10. RELATED ADJUSTMENTS

5-11. Interactive control adjustments are noted in the procedures. Table 5-3 indicates by paragraph numbers the adjustments that must be performed if an assembly has been replaced or repaired, or if an adjustment has been made on an assembly.

Table 5-1. Adjustable Components (1 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A3R1	ASTIG	5-13	27		Adjusts astigmatism of CRT display.
A3R2	TRACE ALIGN	5-14	27		Aligns X and Y axes with graticule display.
A4C8	HF ADJUST	5-15	30		Adjusts risetime of Z-axis gate.
A4R18	HF GAIN	5-15	30		Adjusts high frequency gain of Z-axis driver.
A5R27	GAIN	5-17	29		Adjusts gain of Y-axis deflection ampl.
A6R27	GAIN	5-17	28		Adjusts gain of X-axis deflection ampl.
A7R17	WRITE DEPTH	5-16	31		Adjusts storage mesh potential
A7R59	PAT	5-14	31		Corrects for curvature in CRT trace.
A7R63	FLG	5-16	31		Adjusts Flood Gun grid voltage.
A7R64	COLLIMATOR	5-16	31		Adjusts dispersion of flood gun beam.
A7R70	INT	5-16	31		Adjusted to keep intensity constant with changes in persistence.
A7R71	ORTHOG	5-14	31		Adjusts for perpendicular X and Y axes.
A8R13	FOCUS LIMIT	5-13	32		Sets limit of front panel FOCUS control.
A9R2	HV	5-13	32		Adjusts High Voltage Power Supply.
A9R4	INT	5-13	32		Sets maximum CRT trace intensity.
A12R18	REF ADJ	5-23	17	4-8	Adjusts negative reference voltage used in DVM.
A12R37	INPUT BAL	5-23	17	4-8	Balances DVM input amplifier.
A12R53	HYST	5-23	17	4-8	Adjusts scale offset of DVM near zero.
A12R56	ZERO ADJ	5-23	17	4-8	Adjusts point where DVM polarity change occurs.
A14R57	TICK SWP	5-28	15	4-9	Adjusts sweep voltage to YTO tickler coil.
A14R68	FET OFF	5-28	15	4-9	Nulls offset in VCXO sweep voltage.
A14R71	VCXO SWP	5-28	15	4-9	Adjusts sweep voltage to VCXO.

Table 5-1. Adjustable Components (2 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A15R53	MAIN SWP OFFSET	5-27	11		Compensates for offset between wide and narrow frequency span widths.
A16R9	+10VTV	5-22	10	4-21	Adjusts +10 volt temperature variable supply.
A16R15	1MS	5-22	10	4-23	Calibrates 1 ms per division sweep time.
A16R19	2MS	5-22	10	4-23	Calibrates 2 ms per division sweep time.
A16R25	AST LIMIT	5-22	10		Adjusts AUTO sweep time current limit.
A16R74	SWP STOP	5-22	10	4-23	Sets maximum positive sweep ramp voltage.
A17R11	+10VR	5-23	12	4-8	Adjusts +10 volt reference supply.
A17R43	YTF OFFSET N2	5-30	12		Adjusts YTF sweep offset on 3.8 – 8.5 GHz FREQUENCY BAND.
A17R50	YTF OFFSET N3	5-30	12		Adjusts YTF sweep offset on 5.8 – 12.9 GHz FREQUENCY BAND.
A17R57	YTF OFFSET N4	5-30	12		Adjusts YTF sweep offset on 8.5 – 18 GHz FREQUENCY BAND.
A17R64	YTF OFFSET N5	5-30	12		Adjusts YTF sweep offset on 10.5 – 22 GHz FREQUENCY BAND.
A17R125	CF OFF	5-23	12	4-8	Nulls offset in center frequency analog voltage.
A19R5	YTO OFFSET	5-24	14	4-8	Adjusts YTO lower frequency to 2.05 GHz.
A19R8	YTO GAIN	5-24	14	4-8	Adjusts YTO upper frequency to 4.4 GHz.
A19R14	YTF OFFSET	5-24, 5-30	14		Adjusts YTF tracking at 2 GHz
A19R17	YTF GAIN	5-24, 5-30	14		Adjusts YTF tracking at 10 GHz
A19R39	YTF LIN 13	5-30	14		Adjusts YTF tracking at 13 GHz.
A19R42	YTF LIN 16	5-30	14		Adjusts YTF tracking at 16 GHz.
A19R45	YTF LIN 18	5-30	14		Adjusts YTF tracking at 18 GHz.

Table 5-1. Adjustable Components (3 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A19R48	YTF LIN 20	5-30	14		Adjusts YTF tracking at 20 GHz.
A19R51	YTF LIN 22	5-30	14		Adjusts YTF tracking at 22 GHz.
A20R1	V3	5-29, 5-31	19	4-20	Adjusts mixer diode bias, 3.8 – 8.5 GHz
A20R2	V5	5-29, 5-31	19	4-20	Adjusts voltage mixer diode bias, 8.5 – 18 GHz.
A20R3	V4	5-29, 5-31	19	4-20	Adjusts mixer diode bias, 0.01 – 4.1 GHz, 5.8 – 12.9 GHz.
A20R5	R5	5-31	19	4-20	Adjusts output resistence for mixer diode bias, 8.5 – 18 GHz.
A20R6	V6	5-29, 5-31	19	4-20	Adjusts mixer diode bias, 10.5 – 22 GHz.
A20R7	B1A	5-31	19	4-20	Frequency response compensation, lower part of .01 – 1.8 GHz band.
A20R8	B1B	5-31	19	4-20	Frequency response compensation, upper part of .01 – 1.8 GHz band.
A20R9	B2A	5-31	19	4-20	Frequency response compensation, lower part of 1.7 – 4.1 GHz band.
A20R10	B2B	5-31	19	4-20	Frequency response compensation, middle part of 1.7 – 4.1 GHz band.
A20R11	B2C	5-31	19	4-20	Frequency response compensation, upper part of 1.7 – 4.1 GHz band.
A20R12	B3A	5-31	19	4-20	Frequency response compensation, lower part of 3.8 – 8.5 GHz band.
A20R13	B3B	5-31	19	4-20	Frequency response compensation, upper part of 3.8 – 8.5 GHz band.
A20R14	B4A	5-31	19	4-20	Frequency response compensation, lower part of 5.8 – 12.9 GHz band.
A20R15	B4B	5-31	19	4-20	Frequency response compensation, middle part of 5.8 – 12.9 GHz band.
A20R16	B5A	5-31	19	4-20	Frequency response compensation, lower part of 8.5 – 18 GHz band.

Table 5-1. Adjustable Components (4 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A20R17	B5B	5-31	19	4-20	Frequency response compensation, middle part of 8.5 – 18 GHz band.
A20R18	B5C	5-31	19	4-20	Frequency response compensation, upper part of 8.5 – 18 GHz band.
A20R19	B6A	5-31	19	4-20	Frequency response compensation, lower part of 10.5 – 22 GHz band.
A20R20	B6D	5-31	19	4-20	Frequency response compensation, lower middle part of 10.5 – 22 GHz band.
A20R21	B6C	5-31	19	4-20	Frequency response compensation, upper middle part of 10.5 – 22 GHz band.
A20R22	B6B	5-31	19	4-20	Frequency response compensation, upper part of 10.5 – 22 GHz band.
A20R100	B4C	5-31	19	4-20	Frequency response compensation, upper part of 5.8 – 12.9 GHz band.
A21R52	1 kHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 1 kHz. (Not used for Option 100).
A21R55	3 kHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 3 kHz.
A21R58	10 kHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 10 kHz.
A21R71	300 kHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 300 kHz.
A21R74	1 MHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 1 MHz.
A21R77	3 MHz	5-20	25	4-10	Adjusts IF bandwidth for RESOLUTION BW of 3 MHz.
A21R92	OFFSET	5-19	25		Nulls offset between LIN and 1 dB AMPLITUDE SCALE at top screen.
A22R1	LOG GAIN	5-18	24	4-16	Adjusts dc offset circuitry at output of Log amplifier for 10 dB steps in Log mode.

Table 5-1. Adjustable Components (5 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A22R2	LOG/LIN	5-18	24	4-16, 4-22	Adjusts for Log to linear full screen display translations.
A22R3	LIN GAIN	5-18	24	4-16, 4-22	Adjusts Log Amplifier for 10 dB gain steps when in Linear Mode.
A23C15	SYM	5-20	23	4-10, 4-21	Adjusts symmetry of first stage of crystal bandwidth filter.
A23C23	LC CTR	5-20	23	4-10, 4-21	Adjusts centering of first stage of LC bandwidth filter.
A23C25	CTR	5-20	23	4-10, 4-21	Adjusts centering of first stage of crystal bandwidth filter.
A23C38	SYM	5-20	23	4-10, 4-21	Adjusts symmetry of second stage of crystal bandwidth filter.
A23C45	LC CTR	5-20	23	4-10, 4-21	Adjusts centering of second stage of LC bandwidth filter.
A23C54	CTR	5-20	23	4-10, 4-21	Adjusts centering of second stage of crystal bandwidth filter.
A23C73	C73	5-20	23	4-10, 4-21	Compensates for capacitance of CR3.
A23C74	C74	5-20	23	4-10, 4-21	Compensates for capacitance of CR11.
A23R26	LC	5-20	23	4-10, 4-21	Adjusts feedback in LC circuit of bandpass filter.
A23R31	XTAL	5-20	23	4-10, 4-21	Adjusts feedback in crystal circuit of bandpass filter.
A24R1	40 dB	5-21	22	4-16	Adjusts second 20 dB gain step.
A24R2	20 dB	5-21	22	4-16	Adjusts first 20 dB gain step.
A24R3	10 dB	5-21	22	4-16	Adjusts 10 dB gain step.
A24R4	GAIN	5-21	22	4-16	Adjusts overall gain of IF Assembly.
A24R5	0 dB	5-21	22	4-16	Adjusts to calibrate 0 dB position of REF LEVEL FINE control.
A24R6	12 dB	5-21	22	4-16	Adjusts to calibrate −12 dB position of REF LEVEL FINE control.

Table 5-1. Adjustable Components (6 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A24C35 (Opt. 100)	F_o 100 Hz BW	5-33	39	4-21	Sets frequency of the 18.4 MHz oscillator.
A25C24 (Opt. 100)	LO NULL	5-33	37	4-21	Nulls fundamental and harmonics of the 18.4 MHz oscillator in the 21.4 MHz signal path.
A25R20 (Opt. 100)	DC GAIN	5-33	37	4-21	Sets the amplitude of the 1 kHz, .3 kHz and .1 kHz resolution bandwidth to agree with the 1 MHz amplitude.
A26C2 (Opt. 100)	SYM	5-33	38	4-10, 4-21	SYM adjustments adjust the shape of the filter skirts. CTR adjustments optimize centering and minimize amplitude of the filter shape.
A26C3 (Opt. 100)	CTR	5-33	38	4-10, 4-21	
A26C12 (Opt. 100)	SYM	5-33	38	4-10, 4-21	
A26C13 (Opt. 100)	CTR	5-33	38	4-10, 4-21	
A26C19 (Opt. 100)	SYM	5-33	38	4-10, 4-21	
A26C20 (Opt. 100)	CTR	5-33	38	4-10, 4-21	
A26C25 (Opt. 100)	SYM	5-33	38	4-10, 4-21	
A26C26 (Opt. 100)	CTR	5-33	38	4-10, 4-21	
A26C32 (Opt. 100)	SYM	5-33	38	4-10, 4-21	
A26C33 (Opt. 100)	CTR	5-33	38	4-10	
A26R53 (Opt. 100)	100 Hz GAIN	5-33	38	4-21	Sets the gain of the 100 Hz resolution bandwidth.

Table 5-1. Adjustable Components (7 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A27C15	SYM	5-20	21	4-10, 4-21	Adjusts symmetry of first stage of crysal bandwidth filter.
A27C23	LC CTR	5-20	21	4-10, 4-21	Adjusts centering of first stage of LC bandwidth filter.
A27C25	CTR	5-20	21	4-10, 4-21	Adjusts centering of first stage of crystal bandwidth filter.
A27C38	SYM	5-20	21	4-10, 4-21	Adjusts symmetry of second stage of crystal bandwidth filter.
A27C45	LC CTR	5-20	21	4-10, 4-21	Adjusts centering of second stage of LC bandwidth filter.
A27C54	CTR	5-20	21	4-10, 4-21	Adjusts centering of second stage of crystal bandwidth filter.
A27C73	C73	5-20	21	4-10, 4-21	Compensates for capacitance of CR3.
A27C74	C74	5-20	21	4-10, 4-21	Compensates for capacitance of CR11
A27R26	LC	5-20	21	4-10, 4-21	Adjusts feedback in LC circuit of bandpass filter.
A27R31	XTAL	5-20	21	4-10, 4-21	Adjusts feedback in crystal circuit of bandpass filter.
A28R7	PIN RES	5-31	20	4-20	Compensates for variations in PIN diode resistance.
A35C1	C1	5-25	7	4-10	Adjust bandpass of 2050 MHz bandpass filter.
A35C2	C2	5-25	7	4-10	Adjust bandpass of 2050 MHz bandpass filter.
A35C3	C3	5-25	7	4-10	Adjust bandpass of 2050 MHz bandpass filter.
A35C4	2ND LO FREQUENCY	5-25	7		Adjusts second L.O. frequency to 1728.60 MHz.
A35L1	2ND MIXER MATCH	5-25	7		Adjusts for optimum match between second converter output and third converter input.

Table 5-1. Adjustable Components (8 of 8)

Reference Designator	Adjustment Name	Adjustment Paragraph	Service Sheet	Performance Tests	Description
A36A2C2	1.3 MHz NULL	5-28	16	4-9	Adjust to balance out stray capacitance.
A36A2C3	LINEARITY	5-28	16	4-9	Adjust for linear frequency change with linear sweep input.
A36A2C16	1 MHz PEAK	5-28	16	4-9	Adjusts center frequency of variable frequency filter.
A37C1	321.4 MHz BP ADJUST	5-26	8	4-10	Adjust bandpass of 321.4 MHz bandpass filter.
A37C2	321.4 MHz BP ADJUST	5-26	8	4-10	Adjust bandpass of 321.4 MHz bandpass filter.
A37C3	321.4 MHz BP ADJUST	5-26	8	4-10	Adjust bandpass of 321.4 MHz bandpass filter.
A37C4	321.4 MHz BP ADJUST	5-26	8	4-10	Adjust bandpass of 321.4 MHz bandpass filter.
A37C5	300 MHz BP ADJUST	5-26	8		Adjust bandpass of 300 MHz bandpass filter.
A37C6	300 MHz BP ADJUST	5-26	8		Adjust bandpass of 300 MHz bandpass filter.
A37A3L4	OSC PEAK	5-26	8		Peaks 100 MHz crystal oscillator.
A37A3R27	CAL OUT LEVEL	5-26	8	4-19	Adjsuts 100 MHz CAL OUT to −10 dBm power out.
A39R40	DIG INT	5-23	35		Adjusts intensity of digits on bezel digital readout.
A40A2R17	+15VR ADJ	5-12	36		Adjusts +15 volt power supply.

Table 5-2. Factory Selected Components (1 of 3)

Reference Designator	Adjustment Paragraph	Service Sheet	Performance Test	Basis of Selection
A17R9	5-23	12		Selected so A17R11 + 10 VR can be adjusted to give +10V at A17TP1.
A20R29	5-31	19	4-20	Selected for best frequency response on high end of 5.8 – 12.9 GHz FREQUENCY BAND.
A22R8		24	4-16	Selected for best Log fidelity curve at 700 mV and above (upper portion of Log curve).
A22R16	5-18	24		Selected for full screen translation from Log to linear mode.
A22R23		24	4-16	Selected for best Log fidelity curve at 700 mV and above (opposite sense of A22R8).
A22R46		24	4-16	Selected for best Log fidelity curve at 600 mV and above (upper portion of Log curve).
A22R63		24		Selected to compensate Log fidelity curve for temperature (not field selectable).
A22R64		24		Selected to compensate Log fidelity curve for temperature (not field selectable).
A22R65		24		Selected for best Log fidelity curve at 500 mV and above (upper portion of Log curve).
A22R74		24	4-16	Selected for proper gain of Q9/Q10 IF gain in linear mode with −10V at IFG4 (sixth IF gain step).
A22R82		24	4-16	Selected for best Log fidelity curve at 400 mV and below (lower portion of Log curve).
A22R102		24	4-16	Selected for best Log fidelity curve at 300 mV and below (lower portion of Log curve).
A22R119		24	4-16	Selected for best Log fidelity curve at 200 mV and below (lower portion of Log curve).
A22R130		24		Selected to compensate Log fidelity curve for temperature (not field selectable).
A23R19	5-20	23	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 100 kHz.
A23R23	5-20	23	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 30 kHz.

Table 5-2. Factory Selected Components (2 of 3)

Reference Designator	Adjustment Paragraph	Service Sheet	Performance Test	Basis of Selection
A23R43	5-20	23	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 100 kHz.
A23R48	5-20	23	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 30 kHz.
A24R55 (Option 100)	5-33	39		Selected to give correct 18.4 MHz oscillator power level.
A25R23 (Option 100)	5-33	37	4-21	Selected to shift adjustment range of A25R20 DC GAIN
A26R7 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R9 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R10 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R17 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R18 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW .3 kHz.
A26R19 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R20 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R27 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R28 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .3 kHz.
A26R29 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R30 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R36 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.

Table 5-2. Factory Selected Components (3 of 3)

Reference Designator	Adjustment Paragraph	Service Sheet	Performance Test	Basis of Selection
A26R37 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R39 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R40 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R45 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A26R46 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R48 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R49 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 1 kHz.
A26R54 (Option 100)	5-33	38	4-21	Selected for .3 kHz RESOLUTION BW signal amplitude same as 1 kHz RESOLUTION BW signal amplitude.
A26R64 (Option 100)	5-33	38	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of .1 kHz.
A27R3	5-21	21		Selected to shift adjustment range of A24R4 RF GAIN.
A27R23	5-20	21	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 30 kHz.
A27R43	5-20	21	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 100 kHz.
A27R48	5-20	21	4-10	Selected to give correct IF bandwidth for RESOLUTION BW of 30 kHz.
A28R2	5-32	20	4-16	Selected to shift for correct adjustment range for REF LEVEL CAL.
A28R19	5-31	20	4-20	Selected to provide correct gain compensation of the 5.8 – 12.9 GHz FREQUENCY BAND.
A28R21	5-31	20	4-20	Selected to provide correct gain compensation of the 5.8 – 12.9 GHz FREQUENCY BAND.
A28R23	5-31	20	4-20	Selected to provide correct gain compensation of the 10.5 – 22 GHz FREQUENCY BAND.

Table 5-3. Related Adjustments (1 of 2)

Assembly Changed or Repaired		Perform Adjustments on Following Related Assemblies	Paragraph Number
A1A1	Bezel Display	A39	5-23 step o
A1A2	Display Switch	A1A2	5-16 steps p-q
A3	Display Adjust	A3	Section III Appendix C
A4	Z-Axis Amplifier	A4	5-15
A5	Y Deflection Amplifier	A5	5-17 steps a-b, i-n
A6	X Deflection Amplifier	A6	5-17 steps a-h
A7	Storage Assembly	A7	5-14, 5-16 (except steps p-q)
A8	High Voltage Power Supply	A8, A9	5-13
A9	High Voltage Oscillator	A8, A9	5-13
A12	DVM Analog	A12	5-23 steps a-b, g-n
A14	Tuning Stabilizer Control Assembly	A14	5-28 steps a-m
A15	Sweep Attenuator	A15	5-27
A16	Sweep Generator	A16	5-21
A17	Frequency Control Assembly	A17, A19	5-23 a-f, 5-24, 5-30
A19	YIG Driver	A17, A19	5-24, 5-30
A20	Bias Assembly	A20, A28	5-29, 5-31
A21	Video Assembly	A21	5-19, 5-20 steps a-c, ac-ae
A22	Log Amplifier	A22	5-18
A23	Bandwidth Filter No. 2	A21, A23, A27	5-20

Table 5-3. Related Adjustments (2 of 2)

Assembly Changed or Repaired		Perform Adjustments on Following Related Assemblies	Paragraph Number
A24	Step Gain Amplifier	A24	5-21
A25 (Option 100)	Up-Down Converter	A24, A25	5-21, 5-33 a-b, n-r
A26 (Option 100)	3 MHz Filter	A24, A25, A26	5-33
A27	Bandwidth Filter No. 1	A21, A23, A27	5-20
A28	Variable Gain Assembly	A28	5-31 Check factory selected resistors. A28R2, A28R19, A28R21 and A28R23 are same value as resistors on board being replaced.
A30	First Mixer	A20, A28	5-29, 5-31, 5-32
A31	YTO Assembly	A19	5-24 steps a-h
A32	YTF Assembly	A17, A19, A20, A28	5-24, 5-30, 5-31, 5-32
A34	RF Attenuator	A20, A28	5-31, 5-32
A35	Second Converter	A35	5-25
A36	Tuning Stabilizer	A14, A36	5-28
A37	Third Converter	A37	5-26
A39	Readout Driver	A39	5-23 step o
A40	Power Supply	A40	5-12

5-12. LOW VOLTAGE POWER SUPPLY CHECK AND ADJUSTMENT

REFERENCE:

Service Sheet 36

DESCRIPTION:

The +15 volt supply is adjusted for correct output and the remaining low voltage supplies are checked for correct output.

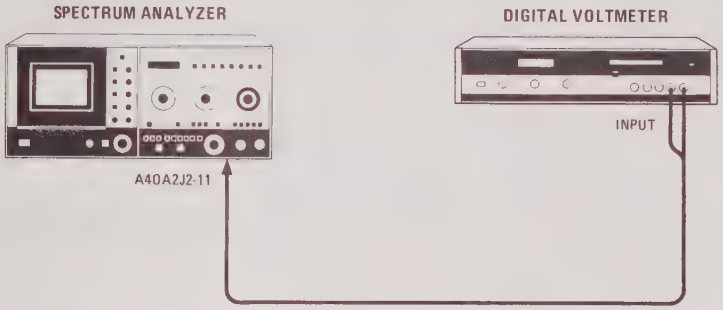


Figure 5-1. Low Voltage Power Supply Check and Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter ..... HP 3490A

BOTTOM VIEW

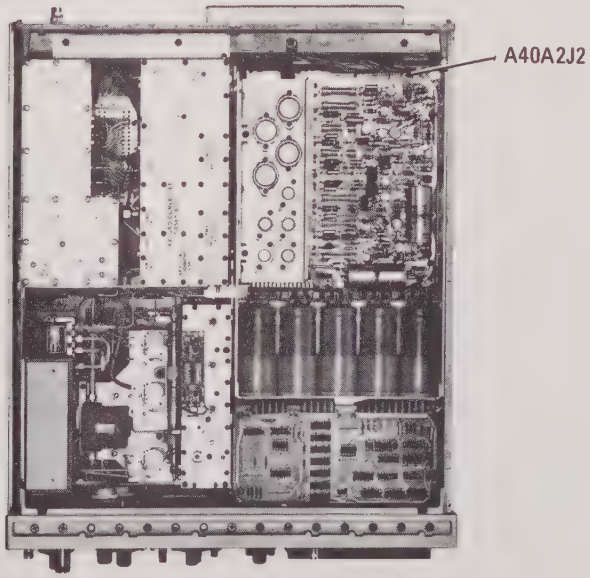


Figure 5-2. A40A2 Adjustment Location

5-12. LOW VOLTAGE POWER SUPPLY CHECK AND ADJUSTMENT(Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A bottom cover to gain access to low voltage power supplies. Connect equipment as shown in Figure 5-1.

b. Reconnect power cord, set LINE switch ON, and connect digital voltmeter to A40A2J2-11.

NOTE

The +15V supply voltage to A16 Sweep Generator is a critical voltage. Due to the significant voltage drop caused by the printed circuit board trace, this voltage must be adjusted for +15.00V at A40A2J2-11.

c. Adjust +15V REF A40A2R17 for +15.00 Vdc ±0.005 Vdc at A40A2J2-11 (Figure 5-2).

WARNING

The following check probes voltages that, if contacted, may cause personal injury.

d. Check power supply voltages listed in Table 5-4.

Table 5-4. Low Voltage Power Supplies

Test Point	Voltage (Vdc)	Tolerance (Vdc)
TP10	+158	±5.0
TP9	+30	±0.30
TP8	+20	±0.20
TP3	+15	±0.10
TP5	+10	±0.10
TP1	+5.2	±0.05
TP6	−10	±0.10
TP4	−15	±0.15
TP2	−40	±0.4

5-12. LOW VOLTAGE POWER SUPPLY CHECK AND ADJUSTMENT(Cont'd)

e. Adjustment and checks complete. Set LINE switch OFF, disconnect power cord, and replace 8565A bottom cover.

5-13. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT

REFERENCE:

Service Sheet 32

DESCRIPTION:

A high voltage probe is required to measure high voltage CRT cathode supply. First, the probe accuracy is checked by comparing measurements of the +158V supply with, and without, the probe in the test setup. Any error is then calculated into the test setup for setting high voltage CRT cathode supply. The FOCUS LIMIT adjustment is set for a sharply focused display with front panel FOCUS control set at midrange. The Intensity Limit adjustment is then set to limit the CRT control grid voltage and, in effect, limit the maximum CRT trace intensity.

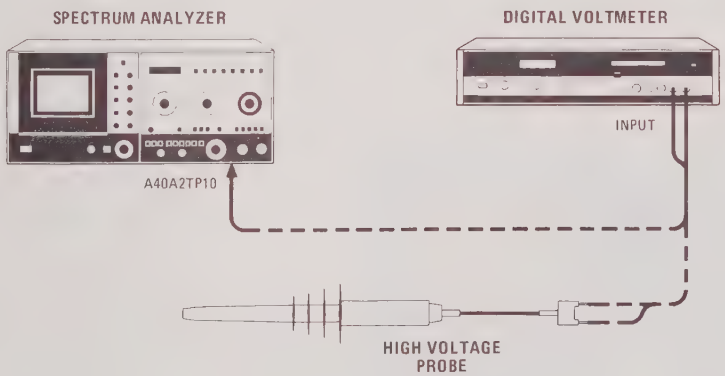


Figure 5-3. High Voltage Power Supply Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter	HP 3490A
High Voltage Probe (1000:1 Divider)	HP 34111A
Oscilloscope	HP 1740A
10:1 Divider Probe	HP 10004D

WARNING

To minimize shock hazard use a non-metallic screwdriver for adjustments on A8 High Voltage Power Supply and A9 High Voltage Oscillator.

WARNING

The following procedure probes voltages that, if contacted, may cause personal injury or death.

5-13. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT (Cont'd)

NOTE

Adjustment of the High Voltage Power Supply should not be a routine-maintenance procedure. Adjustment should only be done when the HV Power Supply or HV Oscillator is repaired or replaced.

NOTE

If an assembly or an adjustable component is replaced, set all adjustments on the replaced assembly to midrange (except A9R1 INT, which should not be changed) before turning the instrument on. If the CRT is replaced, set front panel INTENSITY control fully counterclockwise before applying power.

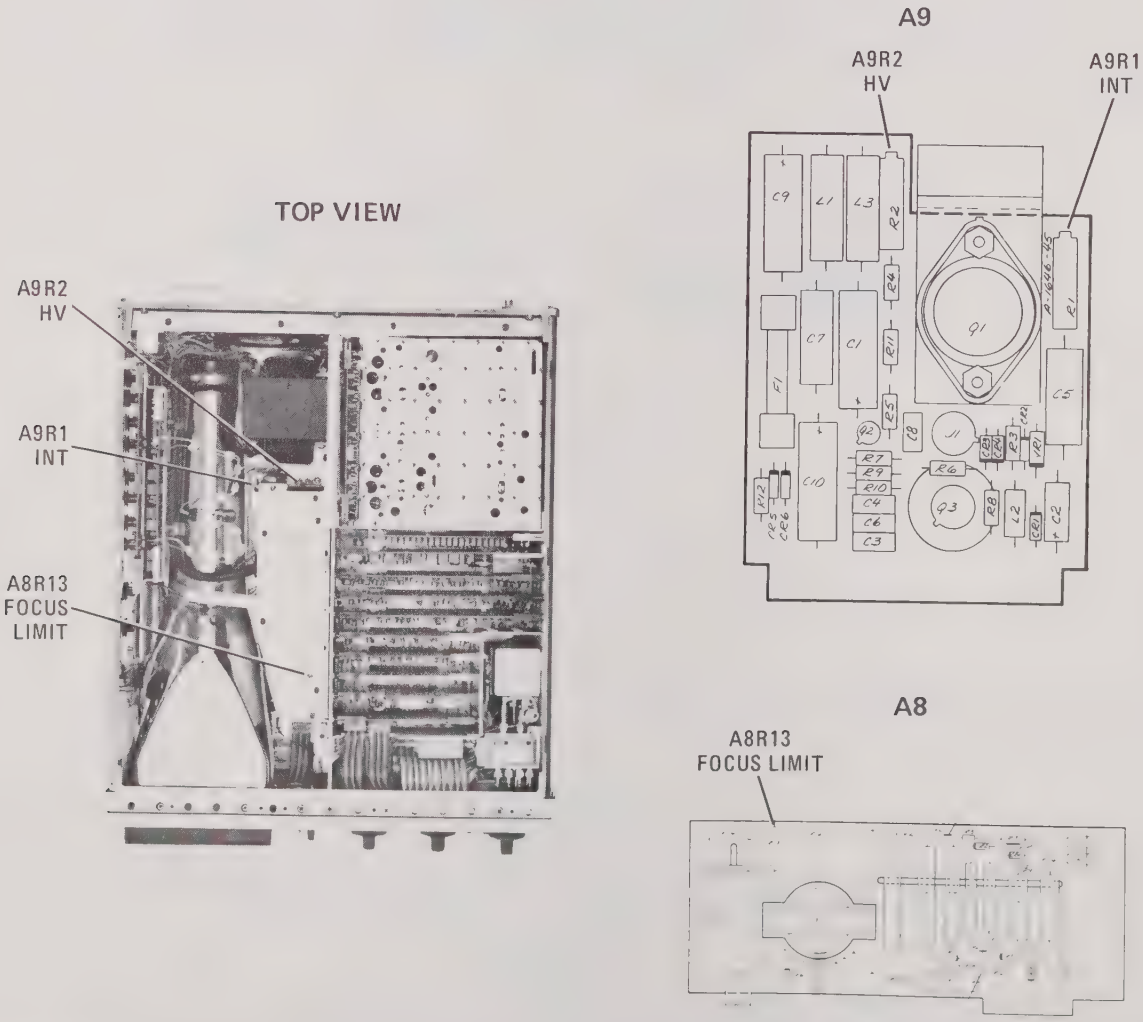


Figure 5-4. High Voltage Power Supply and Oscillator Driver Adjustment Locations

5-13. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT (Cont'd)

PROCEDURE:

WARNING

After disconnecting AC line power cord, allow a minimum of 30 seconds for High Voltage Power Supply to discharge before removing High Voltage Power Supply protective cover.

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top and bottom covers. Remove High Voltage Power Supply protective cover. Connect equipment as shown in Figure 5-3.

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

INPUT ATTEN	0 dB
REFERENCE LEVEL	0 dBm
AMPLITUDE SCALE	LIN
CONVentional	Depressed
PERSIST	Fully counterclockwise
FOCUS	Midrange
INTENSITY	Dim CRT trace

High Voltage Power Supply

c. Calibrate High Voltage probe as follows:

1. Measure output of +158V supply at A40A2TP10 and note reading.

+ _____ Vdc

2. Connect 1000:1 divider probe to digital voltmeter and set voltmeter to .1V range.

3. Measure +158V supply through 1000:1 divider probe and note reading.

+ _____ Vdc

4. Divide reading noted in step c-1 into reading noted in step c-3. This gives the calibration factor of the high voltage probe.

d. Set digital voltmeter to 10V range and measure output of high voltage CRT cathode power supply on board assembly A8 HVTP (yellow wire). TP1

e. Adjust A9R2 HV (Figure 5-4) for a reading equal to the calibration factor, calculated in step c-4, times −3000 volts.

Focus Centering

f. Depress both INT and EXT SWEEP SOURCE pushbuttons to produce a dot on the CRT screen.

5-13. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT (Cont'd)

CAUTION

Leaving a dot on the CRT for prolonged periods at high intensity will damage CRT.

g. Adjust front panel INTENSITY, HORIZ POSN and VERT POSN controls for a spot of normal intensity near center of screen.

h. With front panel FOCUS control set to midrange, adjust A8R13 FOCUS LIMIT (Figure 5-4) and front panel ASTIG (A3R1) for a sharply focused round spot.

i. Depress INT SWEEP SOURCE pushbutton to return 8565A to internal sweep.

Intensity Limit

j. Connect oscilloscope, through 10:1 divider probe, to A8TP1 (see Figure 5-5).

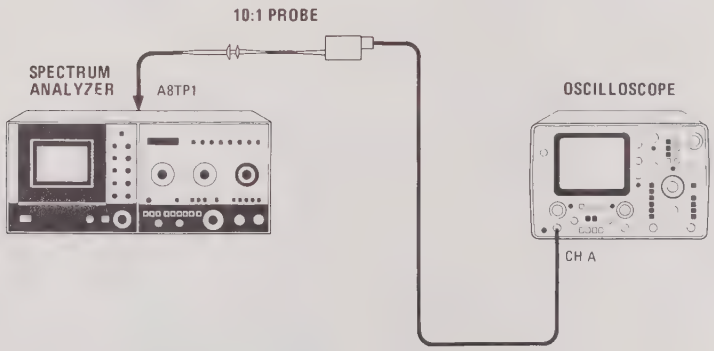


Figure 5-5. Intensity Limit Adjustment Test Setup

k. Set front panel HORIZ POSN and VERT POSN controls fully counterclockwise; then set front panel INTENSITY control fully clockwise.

l. Adjust A9R1 INT (Figure 5-4) for an 8 volts peak-to-peak signal at ~~A8TP1~~.

m. Disconnect oscilloscope, set front panel INTENSITY control fully counterclockwise, and set front panel HORIZ POSN and VERT POSN controls to midrange.

5-13. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT (Cont'd)

WARNING

After disconnecting ac line power cord, allow a minimum of 30 seconds for High Voltage Power Supply to discharge before replacing High Voltage Power Supply protective cover.

n. Set LINE switch OFF, disconnect power cord, and wait a minimum of 30 seconds before replacing High Voltage Power Supply protective cover. Replace 8565A top and bottom covers.

5-14. ORTHOGONALITY, TRACE ALIGNMENT, AND PATTERN ADJUSTMENT

REFERENCE:

Service Sheet 31

DESCRIPTION:

The CRT trace baseline is positioned on a horizontal graticule line and the 100 MHz CAL OUTPUT signal display is positioned on the right vertical graticule line. Adjustments are performed until both the horizontal and vertical traces are aligned with the respective graticule lines. This results in the horizontal and vertical traces being mutually perpendicular and aligned in the horizontal and vertical axes.

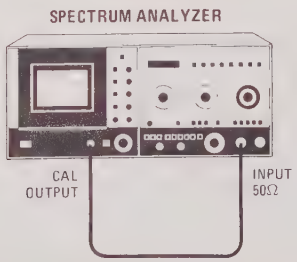


Figure 5-6. Orthogonality, Trace Alignment and Pattern Adjustment Test Setup

5-14. ORTHOGONALITY, TRACE ALIGNMENT AND PATTERN ADJUSTMENT (Cont'd)

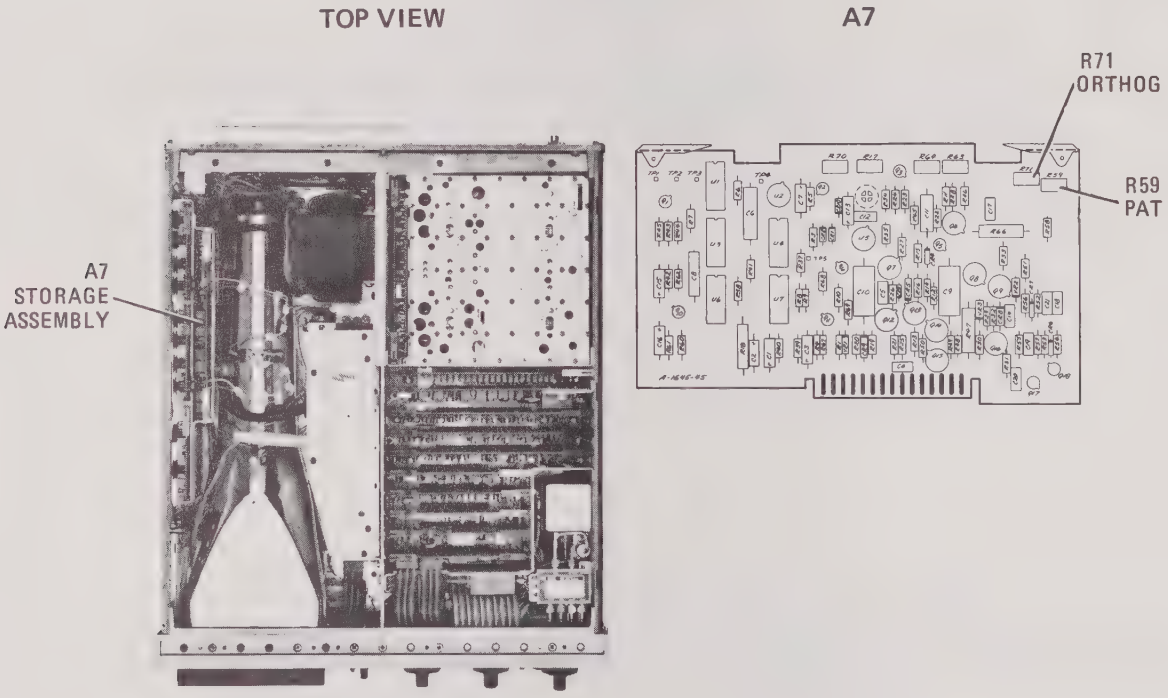


Figure 5-7. Orthogonality and Pattern Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
RESOLUTION BW	100 kHz
FREQUENCY SPAN/DIV	10 MHz
AMPLITUDE SCALE	LIN
TUNING	0.050 GHz
CONVentional	Depressed

c. Connect 100 MHz CAL OUTPUT signal to front panel INPUT 50Ω connector (see Figure 5-6).

d. Adjust front panel VERT POSN to position CRT trace baseline one division above bottom horizontal graticule line.

5-14. ORTHOGONALITY, TRACE ALIGNMENT, AND PATTERN ADJUSTMENT (Cont'd)

e. Adjust front panel TUNING control to position 100 MHz CAL OUTPUT display on right edge of graticule display. Adjust REF LEVEL FINE to position peak of 100 MHz signal at REFERENCE LEVEL graticule line.

f. Adjust front panel TRACE ALIGN to align 100 MHz signal parallel with right edge of graticule display.

g. Adjust R71 ORTHOG (Figure 5-7) to align baseline parallel with the horizontal graticule line.

h. Adjust R59 PAT to remove any curvature in the baseline or 100 MHz signal traces.

i. Repeat steps f through h until no further adjustment is necessary.

j. Adjust front panel VERT POSN to position baseline on bottom horizontal graticule line.

k. Adjustment complete. Set LINE switch OFF, remove power cord, and replace 8565A top cover.

5-15. Z-AXIS GATE ADJUSTMENT

REFERENCE:

Service Sheet 30

DESCRIPTION:

A blanking pulse is connected to rear panel BLANKING INPUT connector. A4 Z-Axis Amplifier output (Z-Axis Gate) is checked with an oscilloscope. Z-Axis adjustments, HF ADJUST, HF GAIN, are set for Z-Axis gate output with fastest rise time and minimum ringing.

5-15. Z-AXIS GATE ADJUSTMENT (Cont'd)

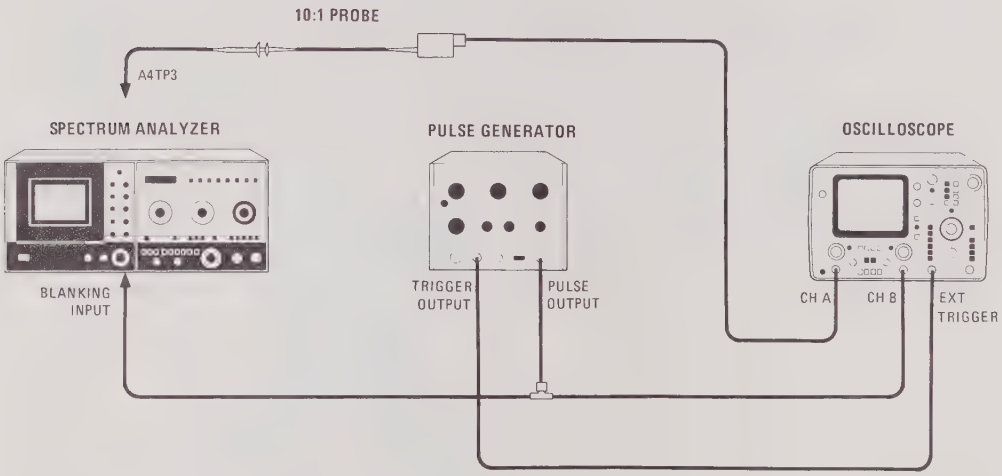


Figure 5-8. Z-Axis Gate Adjustment Test Setup

EQUIPMENT:

Oscilloscope	HP 1740A
Pulse Generator	HP 8002A
10:1 Divider Probe	HP 10004D
BNC Tee	1250-0781

5-15. Z-AXIS GATE ADJUSTMENT (Cont'd)

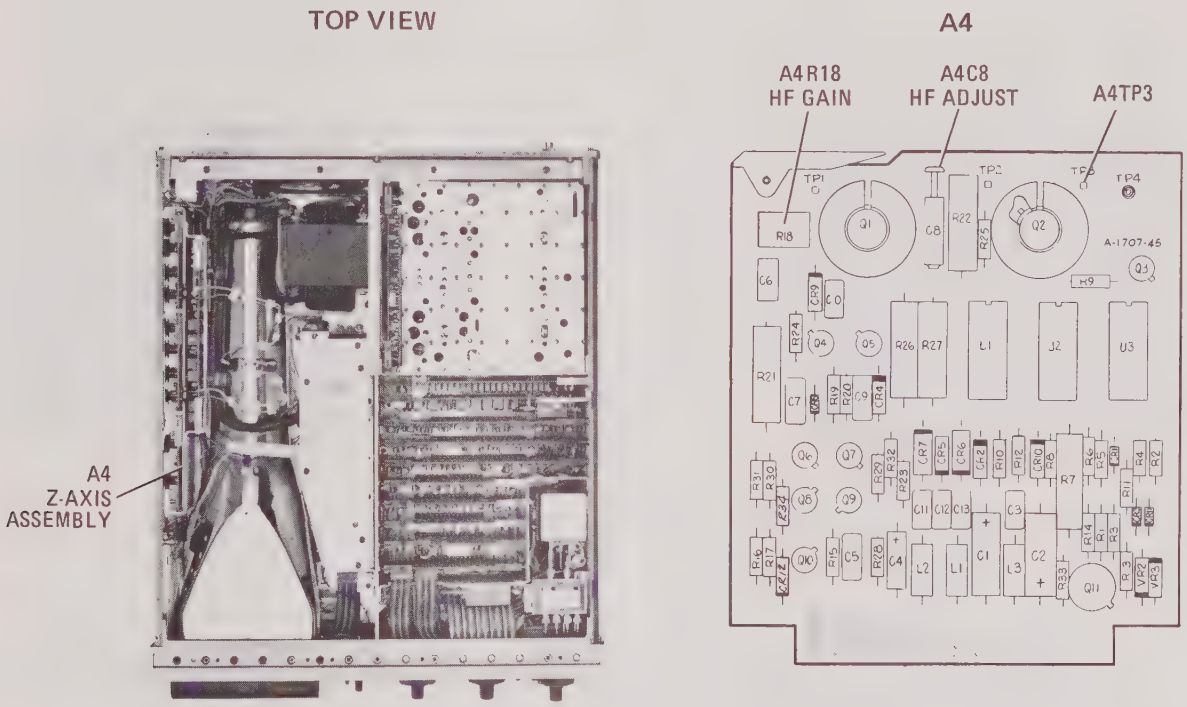


Figure 5-9. Z-Axis Gate Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover. Connect equipment as shown in Figure 5-8. Adjustment locations are shown in Figure 5-9.

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)
SWEEP SOURCE ..... EXT
CONVentional ..... Depressed

c. Set pulse generator for a 0 to +4 volt pulse with a 10 microsecond pulse width repeating every 100 microseconds (10% duty cycle as shown in Figure 5-10).

d. Set HORIZ POSN and VERT POSN controls fully counterclockwise to put trace off CRT screen.

e. Set front panel INTENSITY control to midrange.

f. Connect oscilloscope (Channel A) to A4TP3 GATE OUT (Figure 5-9).

g. Set oscilloscope controls for a Channel A display as shown in Figure 5-11.

5-15. Z-AXIS GATE ADJUSTMENT (Cont'd)

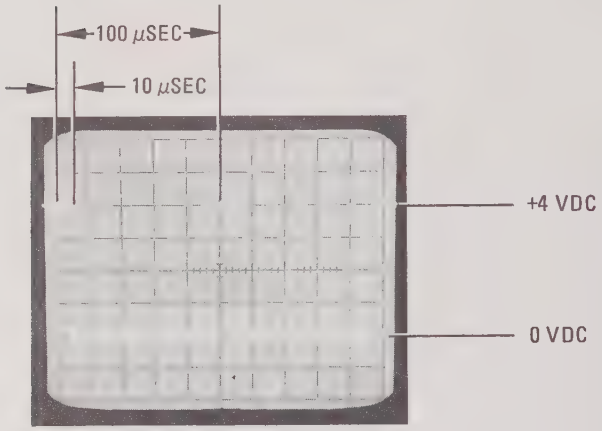


Figure 5-10. Pulse Generator Output for a 10% Duty Cycle

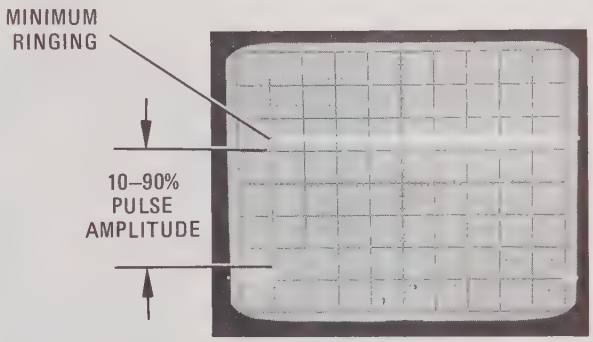


Figure 5-11. Z-Axis Gate Output Oscilloscope Display

h. Adjust A4C8 HF ADJUST and A4R18 HF GAIN (Figure 5-9) for an oscilloscope display with fastest rise time and minimum ringing (Figure 5-11). Check rise time between 10% and 90% of pulse amplitude. Rise time should be less than or equal to 50 nanoseconds.

i. Adjustment complete. Set LINE switch OFF, disconnect power cord, and replace 8565A top cover.

5-16. STORAGE DISPLAY ADJUSTMENTS

REFERENCE:

Service Sheet 31

DESCRIPTION:

The 8565A is operated in WRITE mode with INTENSITY and PERSISTence controls turned fully counterclockwise. The CRT background brightness is set by adjusting the Flood Gun Grid voltage. The Collimation adjustment is then made for a Flood Gun pattern that just covers the CRT screen. WRITE DEPTH is set so the CRT screen turns dark green after the display is erased. The Intensity/Persistence adjustment is set for a trace of approximately the same brightness in either the maximum or minimum persistence settings.

5-16. STORAGE DISPLAY ADJUSTMENTS (Cont'd)

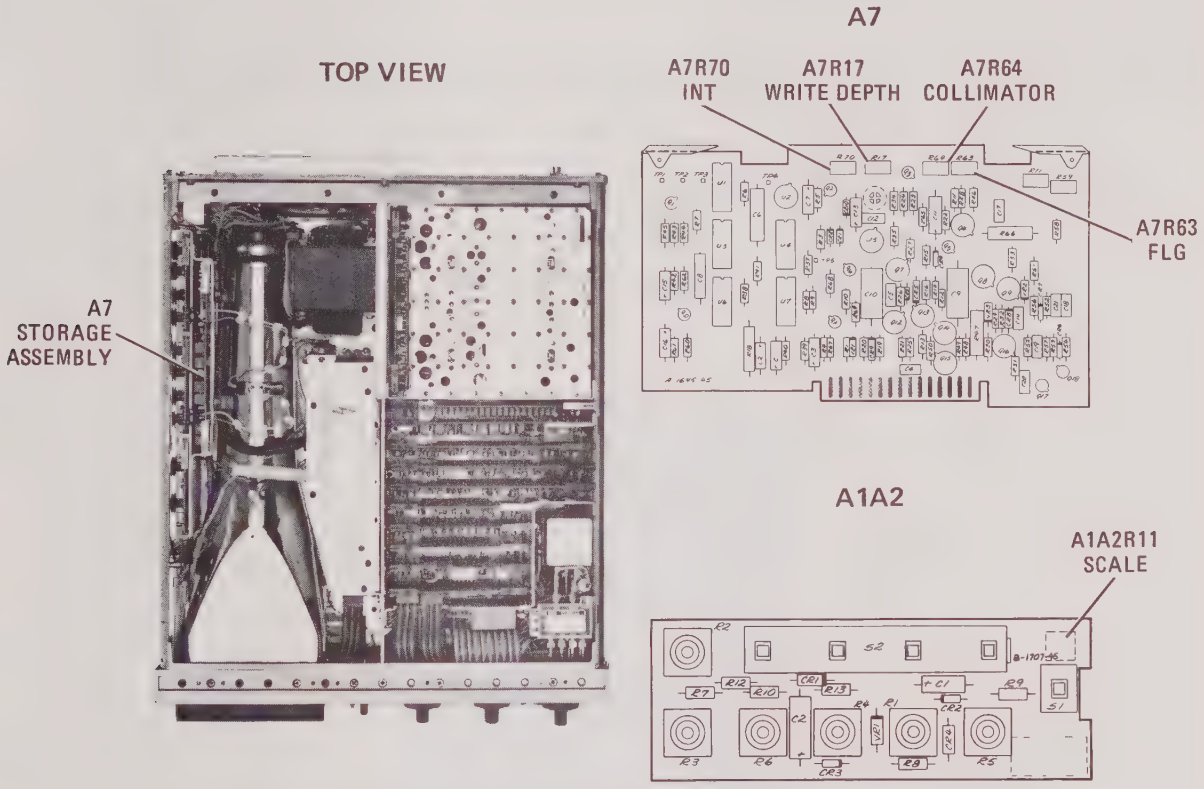


Figure 5-12. Storage Assembly Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
INPUT ATTEN	10 dB
REF LEVEL	−10 dBm
REF LEVEL FINE	0
RESOLUTION BW	100 kHz
FREQUENCY SPAN/DIV	2 MHz
TUNING	0.100 GHz

5-16. STORAGE DISPLAY ADJUSTMENTS (Cont'd)

Collimation

c. Set front panel INTENSITY and PERSIST controls fully counterclockwise.

d. Press and release front panel ERASE pushbutton.

e. Set A7R64 COLLIMATOR adjustment (Figure 5-12) for an overcollimated CRT display as shown in Figure 5-13 (bright green center area with dark edges.)

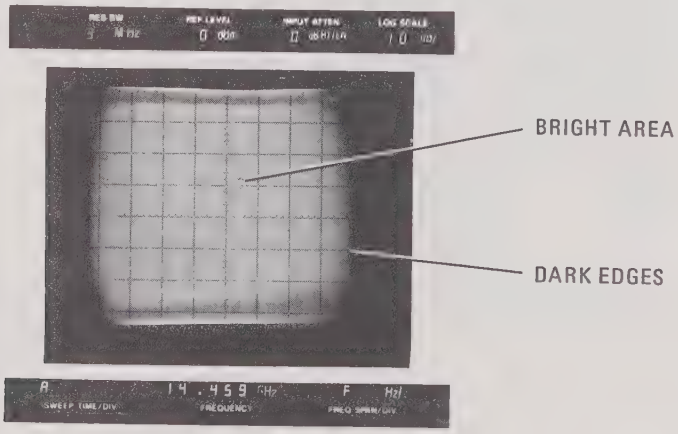


Figure 5-13. Overcollimated CRT Display

f. Set A7R63 FLG (Flood Gun Grid) (Figure 5-12) fully counterclockwise.

NOTE

When adjusting FLG in step g, the background brightness will first increase rapidly, then increase more slowly, then decrease (starting at the edges). Set FLG at point of transition from rapid increase to increasing more slowly in pattern brightness.

g. Slowly adjust A4R63 FLG clockwise until initial rapid increase in pattern brightness is passed.

h. Slowly adjust A7R64 COLLIMATOR (Figure 5-12) clockwise until bright green area just fills CRT screen. (Collimation dimples may protrude as far as 3 millimeters in from the outer edge of CRT).

i. Connect 100 MHz CAL OUTPUT to INPUT 50Ω and adjust INTENSITY and TUNING controls to display the 100 MHz signal at center of CRT screen. If CRT background brightness is changing at the sweep rate, readjust A7R64 COLLIMATOR to eliminate flickering background brightness.

5-16. STORAGE DISPLAY ADJUSTMENTS (Cont'd)

Write Depth

j. Set front panel INTENSITY control fully counterclockwise and front panel PERSIST control fully clockwise.

k. Set A7R17 WRITE DEPTH (Figure 5-12) fully clockwise. Press and release front panel ERASE pushbutton; note that CRT screen remains bright green.

l. Adjust A7R17 WRITE DEPTH counterclockwise until CRT screen turns dark green after pressing and releasing ERASE pushbutton. Then set A7R17 WRITE DEPTH approximately 10 degrees further counterclockwise.

Intensity/Persistence

m. Adjust front panel INTENSITY, and TUNING controls to display 100 MHz signal at center of CRT screen.

n. Set front panel PERSIST control fully clockwise and adjust front panel INTENSITY control for a trace with minimum brightness. (Press ERASE pushbutton as necessary when adjusting INTENSITY).

o. Set PERSIST control fully counterclockwise and adjust A7R70 INT (Figure 5-12) for a trace with minimum brightness.

Scale Intensity

p. Depress front panel SCALE pushbutton and set SCALE INTEN control to midrange (center of blue area).

NOTE

If a photography exposure meter is not available, use an oscilloscope camera (i.e. HP 197A). Set f stop to f16, shutter speed to 1 second, and turn off flash. Adjust A1A2R11 SCALE adjustment so a photograph taken with the camera has approximately the same background brightness as photograph in Figure 5-11. A clockwise adjustment of A1A2R11 decreases background brightness.

q. Position photography exposure meter flush to CRT safety face plate and adjust A1A2R11 SCALE adjustment for an exposure value of 7 E.V. at an ASA of 100.

r. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-17. HORIZONTAL AND VERTICAL GAIN ADJUSTMENTS

REFERENCE:

Service Sheets 28 and 29

DESCRIPTION:

The CRT trace is horizontally centered, then horizontal gain is adjusted for a 10 division wide trace. The trace is positioned on the bottom horizontal graticule line and the 100 MHz CAL OUTPUT is applied as the spectrum analyzer input. REF LEVEL CAL is adjusted for an 800 millivolt output from A21 Video Assembly and the vertical gain is adjusted for eight divisions of CRT trace deflection.

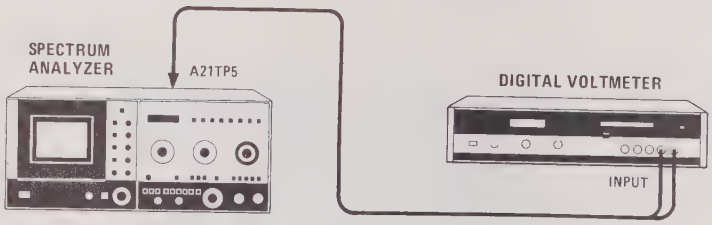


Figure 5-14. Horizontal and Vertical Gain Adjustments Test Setup

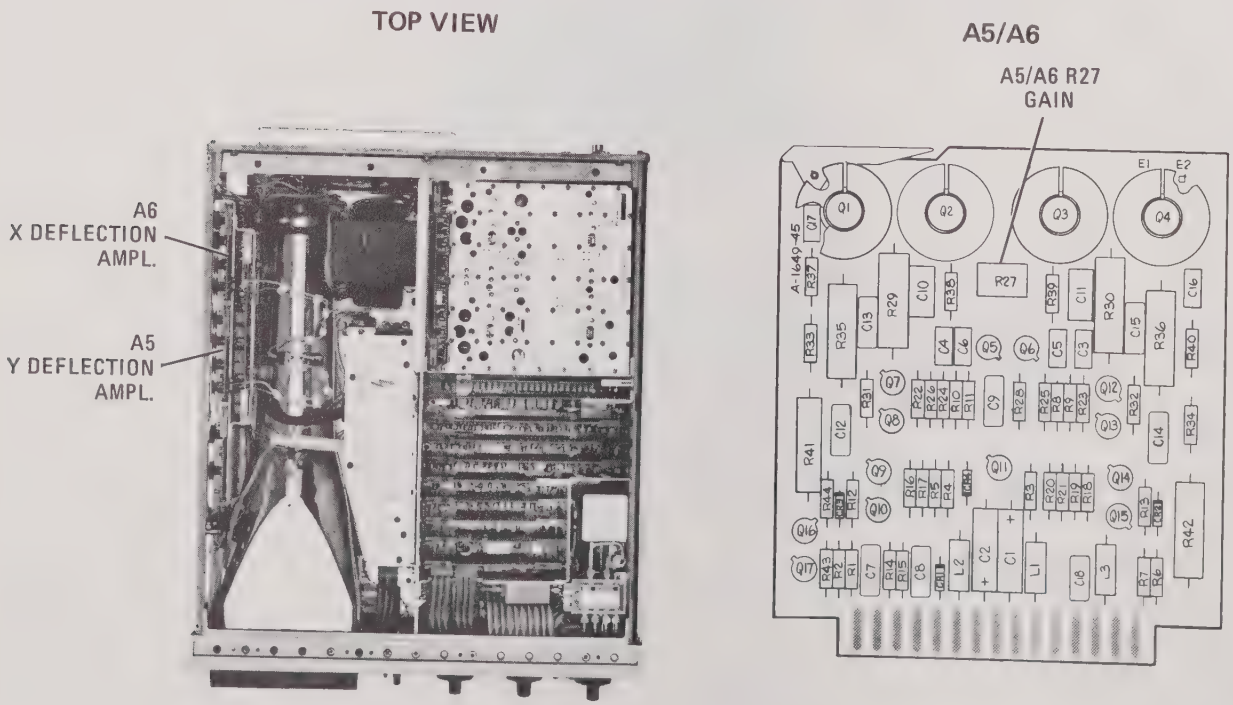


Figure 5-15. Horizontal and Vertical Gain Adjustment Locations

5-17. HORIZONTAL AND VERTICAL GAIN ADJUSTMENTS (Cont'd)

EQUIPMENT:

Digital Voltmeter ..... HP 3490A

WARNING

To minimize shock hazard, use a non-metallic screwdriver for adjustments on A5 and A6 Deflection Amplifiers.

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-14, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... .01—1.8
RESOLUTION BW (uncoupled) ..... 1 MHz
FREQUENCY SPAN MODE ..... ZERO SPAN
INPUT ATTEN ..... 10 dB
REF LEVEL ..... 0 dBm
REF LEVEL FINE ..... −10
AMPLITUDE SCALE ..... LIN
AUTO STABILIZER ..... OFF
TUNING ..... 0.100 GHz

Horizontal Gain Adjustment

c. Adjust front panel VERT POSN for CRT trace two divisions above bottom horizontal graticule line.

d. Simultaneously depress EXT and INT SWEEP SOURCE pushbuttons to obtain a dot on CRT display.

e. Adjust front panel HORIZ POSN to set dot on center vertical graticule line.

f. Switch SWEEP SOURCE to INT.

NOTE

Horizontal GAIN adjustment A6R27 (Figure 5-15) assumes the A16 Sweep Generator INT SWP ramp output is a −5 to +5 volts ramp (see Paragraph 5-22 Sweep Generator Adjustments).

g. Adjust A6R27 GAIN for a 10-division wide CRT trace.

h. Repeat steps d through g until no further adjustment is necessary.

Vertical Gain Adjustment

i. Adjust front panel VERT POSN to set CRT trace on bottom horizontal graticule line and note voltage at A21TP5.

5-17. HORIZONTAL AND VERTICAL GAIN ADJUSTMENTS (Cont'd)

j. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector and adjust front panel TUNING control to peak 100 MHz signal on CRT display.

k. Adjust front panel REF LEVEL FINE for 800 millivolts plus offset measured in step i at A21TP5. (Ensure signal is peaked with front panel TUNING control).

l. Adjust A5R27 GAIN to set signal level on top horizontal graticule line.

m. Disconnect 100 MHz CAL OUTPUT signal and repeat steps i through l until no further adjustment is necessary.

n. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-18. LOG AMPLIFIER ADJUSTMENT

REFERENCE:

Service Sheet 24

DESCRIPTION:

Step attenuators are used to change spectrum analyzer input signal level in calibrated steps. The A21 Video Assembly output is monitored and adjustments are performed to calibrate the A22 Log Amplifier Assembly.

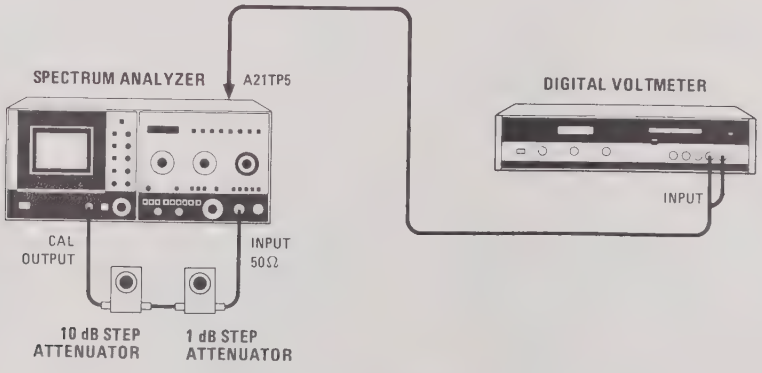


Figure 5-16. Log Amplifier Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter	HP 3490A
10-dB Step Attenuator	HP 355D H80
1-dB Step Attenuator	HP 355C H80

5-18. LOG AMPLIFIER ADJUSTMENT (Cont'd)

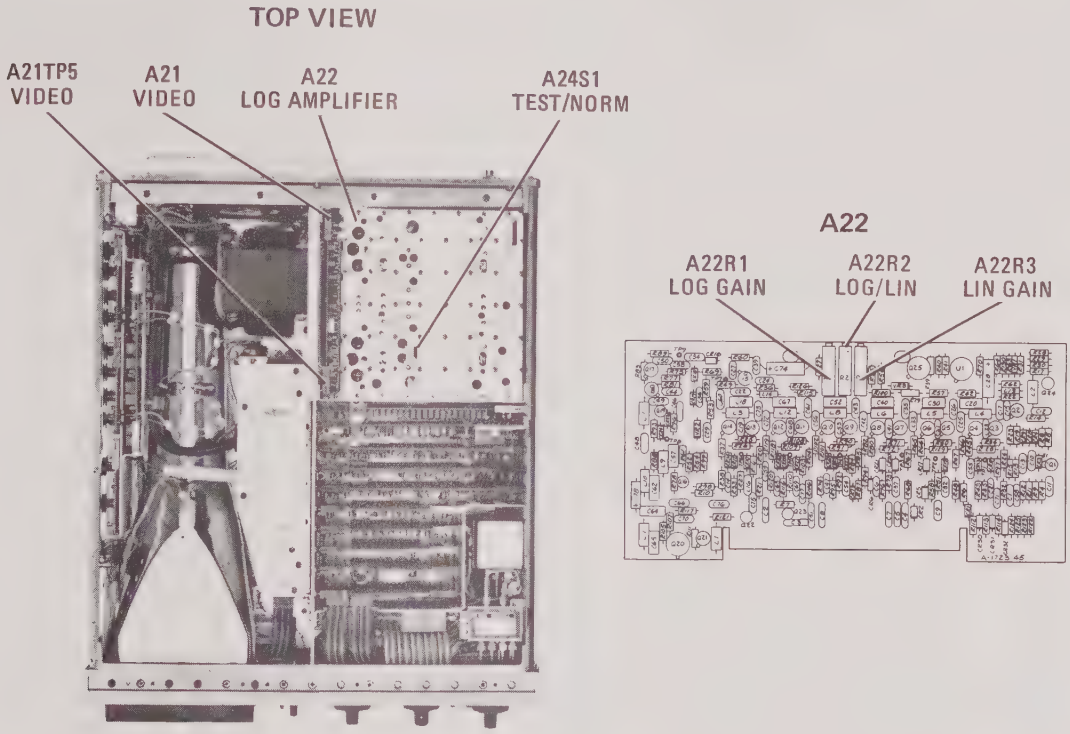


Figure 5-17. Log Amplifier Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, remove 8565A top cover, and set A24S1 TEST-NORM switch to TEST position.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-16, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
INPUT ATTEN	0 dB
REF LEVEL	−50 dBm
REF LEVEL FINE	0
RESOLUTION BW	300 kHz
FREQUENCY SPAN/DIV	10 MHz
AMPLITUDE SCALE	LIN
TUNING	0.100 GHz

5-18. LOG AMPLIFIER ADJUSTMENT (Cont'd)

c. Set REF LEVEL to −50 dBm. Set 10 dB step attenuator to 0 dB and 1 dB step attenuator to 0 dB.

d. Adjust TUNING control to center 100 MHz signal on CRT display. Select ZERO SPAN FREQUENCY SPAN MODE and set VIDEO FILTER to NOISE AVG. Peak signal with FINE TUNING control

e. Adjust front panel REF LEVEL CAL for 700 mV ±1 mV at A21TP5 (VIDEO).

f. Set REF LEVEL control to −80 dBm and 10 dB step attenuator to 30 dB. Adjust A22R3 LIN GAIN (see Figure 5-17) for 700 mV at A21TP5.

g. Step REF LEVEL control from −50 dBm to −90 dBm and 10 dB step attenuator from 0 dB to 40 dB. Check voltage at A21TP5 for each step as shown in Table 5-5. If voltage at A21TP5 is not within limits, readjust A22R3 LIN GAIN for best compromise.

h. Set REF LEVEL to −50 dBM and 10 dB step attenuator to 120 dB. Record offset reading at A21TP5. The offset should be less than ±30 mV.

_____ Offset

i. Set AMPLITUDE SCALE to 10 dB/DIV and set 10 dB step attenuator to 40 dB.

j. Adjust front panel REF LEVEL CAL for a digital voltmeter reading of 400 mV plus offset recorded in step h (algebraic sum). (Example: If offset is −23 mV, adjust REF LEVEL CAL for a DVM reading of 377 mV.)

k. Set 10 dB step attenuator to 0 dB. Digital voltmeter should indicate 800 mV, plus offset (algebraic sum) ±1 mV. If DVM reading is not within limits, adjust A22R2 LOG/LIN adjustment for a digital voltmeter reading of 800 mV, plus offset minus 50 percent of overshoot. Example: If DVM indicates 767 mV and should be indicating 777 mV (−10 mV overshoot), adjust A22R2 for a DVM reading of 777 mV minus −5 mV (782 mV).

Table 5-5. Linear Gain Adjustment Limits

REF LEVEL	10-dB Step Attenuator	Voltage (A21TP5)
−50 dBm	0 dB	700 mV (Reference)
−60 dBm	10 dB	700 mV ±20 mV
−70 dBm	20 dB	700 mV ±20 mV
−80 dBm	30 dB	700 mV ±20 mV
−90 dBm	40 dB	700 mV ±30 mV

5-18. LOG AMPLIFIER ADJUSTMENTS (Cont'd)

l. Repeat steps i, j, and k until digital voltmeter indicates 800 mV plus offset ±1 mV with no further adjustment of A22R2 in step k.

m. Set 10 dB step attenuator to the positions shown in Table 5-6 and record DVM reading for each setting. Correct the DVM readings by algebraically adding the offset recorded in step h. If necessary, readjust A22R2 to meet the limits in Table 5-6.

Table 5-6. Log Fidelity Check

STEP ATTENUATOR SETTING (dB)	DVM READING (mV)	DVM READING CORRECTED FOR OFFSET		
		Min. (mV)	Actual (mV)	Max. (mV)
0	_____	799	_____	801
10	_____	697	_____	703
20	_____	596	_____	604
30	_____	496	_____	504
40	_____	395	_____	405
50	_____	294	_____	306
60	_____	193	_____	207
70	_____	92	_____	108

n. Set 10 dB step attenuator to 0 dB and set front panel REF LEVEL CAL for a digital voltmeter reading of 800 mV plus offset recorded in step h ±1 mV.

o. Set AMPLITUDE SCALE to LIN. The digital voltmeter should indicate the reading set in step n ±25 mV. If it does, go to step q. If it does not,or if Log fidelity is not within limits, go to step p and select A22R16*.

p. Select A22R16* to obtain an output in step o within ±25 mV of the reading set in step n. Decreasing A22R16* 10 percent will increase the DVM reading approximately 30 mV in step o.

5-18. LOG AMPLIFIER ADJUSTMENT (Cont'd)

NOTE

Log fidelity must be considered when selecting A22R16*. That is, if the DVM READING CORRECTED FOR OFFSET in Table 5-6 is greater than 100 mV for a STEP ATTENUATOR SETTING of 70 dB, A22R16* should be selected for a DVM reading greater than the reading set in step n. If the READING CORRECTED FOR OFFSET is less than 100 mV, A22R16* should be selected for a DVM reading less than the reading set in step n.

q. Adjust front panel REF LEVEL CAL for a digital voltmeter reading of 800 mV plus offset (algebraic sum) ±1 mV

r. Set AMPLITUDE SCALE to 10 dB/DIV and adjust A22R2 LOG/LIN adjustment for a digital voltmeter reading of 800 mV plus offset.

s. Repeat step m to recheck the Log fidelity.

t. Set REF LEVEL control to −50 dBm and set AMPLITUDE SCALE to 1 dB/DIV.

u. Set 10 dB step attenuator to 0 dB and adjust front panel REF LEVEL CAL for a digital voltmeter reading of 700 mV (do not include offset).

v. Set REF LEVEL control to −90 dBm and set 10 dB step attenuator to 40 dB. Adjust A22R1 LOG GAIN for a digital voltmeter reading of 700 mV.

w. Change REF LEVEL and 0 dB step attenuator settings as shown in Table 5-7. Deviation from reference should not exceed the given limits.

Table 5-7. Log Gain Adjustment Limits

REFERENCE LEVEL (dBm)	STEP ATTENUATOR SETTING (dB)	DEVIATION FROM REFERENCE
−50	0	Reference
−60	10	±0.3 DIV ±30 mV
−70	20	±0.3 DIV ±30 mV
−80	30	±0.3 DIV ±30 mV
−90	40	±0.3 DIV ±30 mV

x. Adjustment complete. Set A24S1 TEST-NORM switch to NORM position. Set LINE switch OFF, disconnect power cord, and replace 8565A top cover.

5-19. VIDEO OFFSET ADJUSTMENT

REFERENCE:

Service Sheet 25. (For Option 100, see Service Sheet 40)

DESCRIPTION:

First the GAIN is adjusted in the Y Deflection Amplifier Assembly to place the signal on the REFERENCE LEVEL graticule line of the CRT with a specified voltage at the input to the Video Assembly. Then the LOG/LIN is adjusted in the Log Amplifier Assembly so that the signal remains at the REFERENCE LEVEL line as the AMPLITUDE SCALE is switched between LIN and 10 dB/DIV. Finally, the OFFSET is adjusted in the Video Assembly so that the signal remains at the REFERENCE LEVEL line as the AMPLITUDE SCALE is switched between 10 dB/DIV and 5, 2, or 1 dB/DIV.

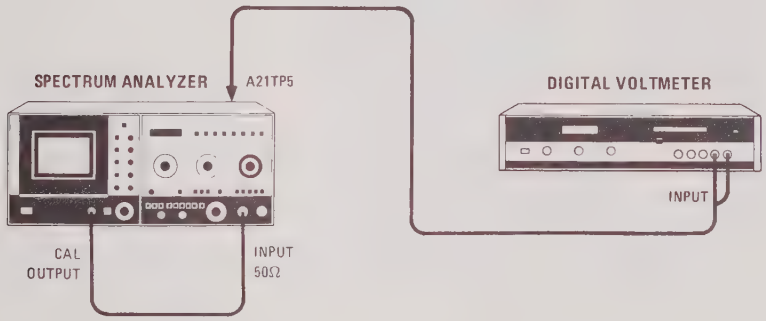


Figure 5-18. Video Offset Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter ..... HP 3490A

5-19. VIDEO OFFSET ADJUSTMENT (Cont'd)

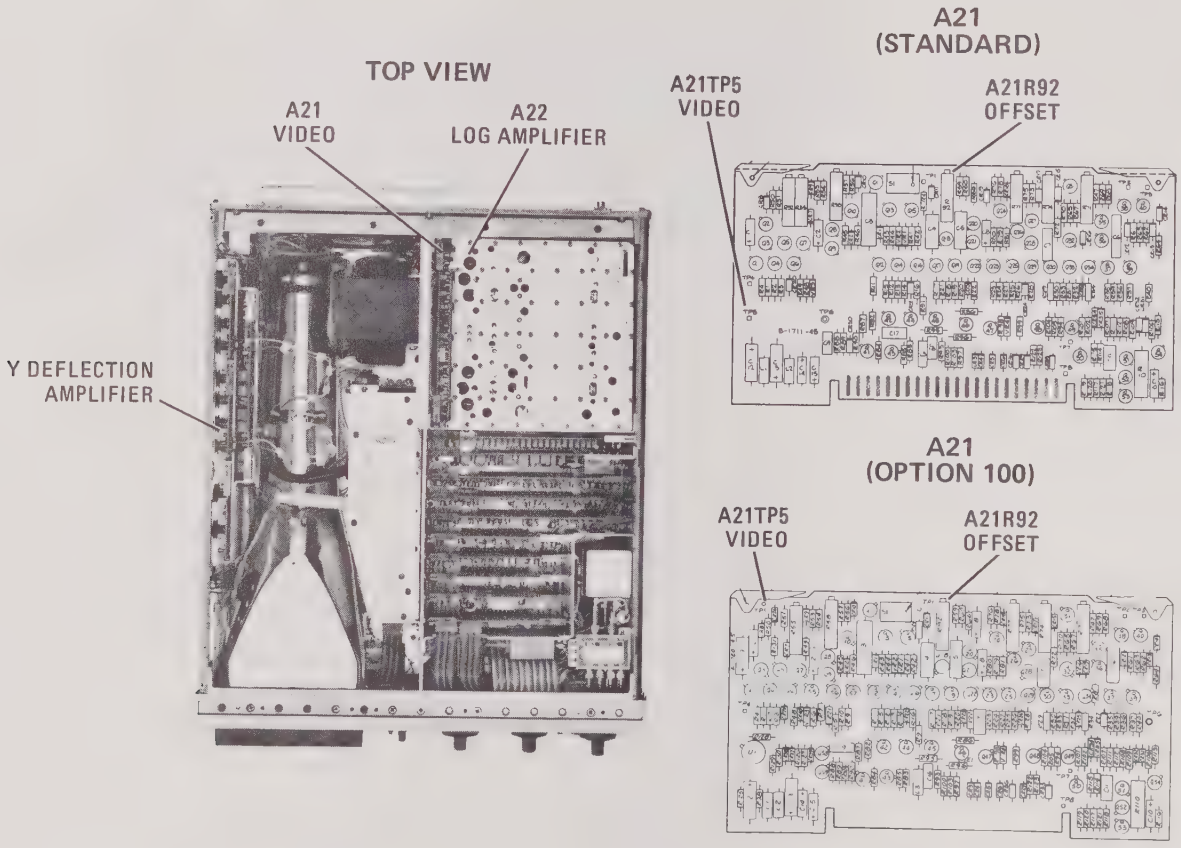


Figure 5-19. Video Offset Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-18, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
INPUT ATTEN	0 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	300 kHz
FREQUENCY SPAN MODE	ZERO SPAN
AMPLITUDE SCALE	LIN
AUTO STABILIZER	OFF
TUNING	0.100 GHz

5-19. VIDEO OFFSET ADJUSTMENT (Cont'd)

c. Adjust front panel VERT POSN to set CRT trace on bottom horizontal graticule line and note offset voltage at A21TP5 VIDEO.

Offset _____ mV

d. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector and adjust front panel TUNING control to peak 100 MHz signal on CRT display.

e. Adjust front panel REF LEVEL FINE control for 800 mV plus offset measured at A21TP5 in step c.

f. Adjust A5R27 GAIN (Figure 5-19) to set signal level on REFERENCE LEVEL graticule line.

g. Disconnect 100 MHz CAL OUTPUT signal and repeat steps c through f until no further adjustment is necessary.

h. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector and set AMPLITUDE SCALE to 10 dB/DIV. Adjust A22R2 LOG/LIN to set signal level on REFERENCE LEVEL graticule line.

i. Adjust A21R92 OFFSET for no signal level change when switching AMPLITUDE SCALE between 10 dB/DIV and 1 dB/DIV positions.

j. Set AMPLITUDE SCALE to 10 dB/DIV and adjust front panel VERT POSN to set signal level on REFERENCE LEVEL graticule line.

k. Disconnect 100 MHz CAL OUTPUT signal and set AMPLITUDE SCALE to LIN. Check that CRT trace is on bottom horizontal graticule line. If not, repeat steps c through g.

l. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector. Select each AMPLITUDE SCALE (10 dB/DIV, 5 dB/DIV, 2 dB/DIV, 1 dB/DIV, and LIN) and check that signal level does not shift more than 0.5 division from REFERENCE LEVEL graticule line.

m. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-20 BANDWIDTH FILTER ADJUSTMENTS

NOTE

These adjustments are for bandwidths 3 MHz through 1 kHz. (For Option 100 instruments, these adjustments are for bandwidths 3 MHz through 3 kHz. For bandwidths 1 kHz through 100 Hz, refer to Paragraph 5-33.)

REFERENCE

Service Sheets 21, 23, and 25 (For Option 100, see Service Sheets 40, 23 and 25).

5-20. BANDWIDTH FILTER ADJUSTMENTS

DESCRIPTION:

Three of the four crystal filters are disabled with crystal shorts. The fourth crystal filter is then adjusted for a symmetrical and centered bandwidth. The crystal shorts are removed one at a time, and the respective crystal filter is adjusted for a symmetrical and centered bandwidth. The LC filters are adjusted by a similar method. The 3-dB bandwidths are checked for each RESOLUTION BW and, if necessary, adjustments are performed to give correct bandwidths.

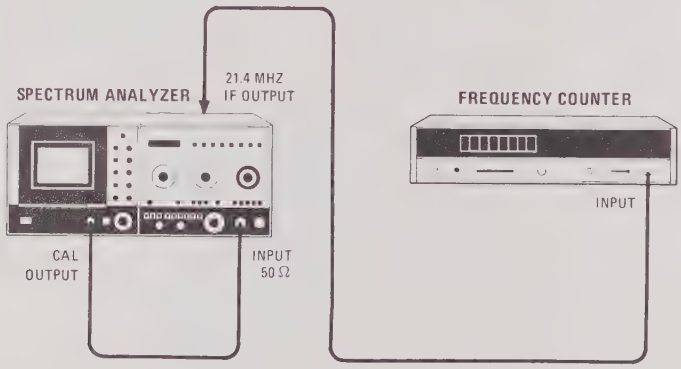


Figure 5-20. Bandwidth Filter Adjustment Test Setup

EQUIPMENT:

Frequency Counter	5340A
Crystal Short (Qty 3)	See Figure 5-19

NOTE

A crystal short consists of a .01 μF capacitor (HP Part No. 0160-0161) and 90.9 ohm resistor (HP Part No. 0757-0400) connected in series. Two square terminal connectors (HP Part No. 0362-0265) are used for connecting the crystal short across the test points.

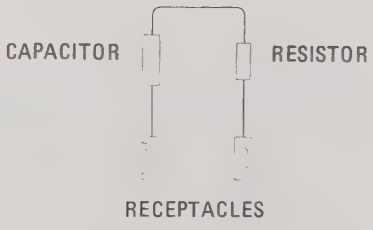


Figure 5-21. Crystal Short Configuration

5-20. BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

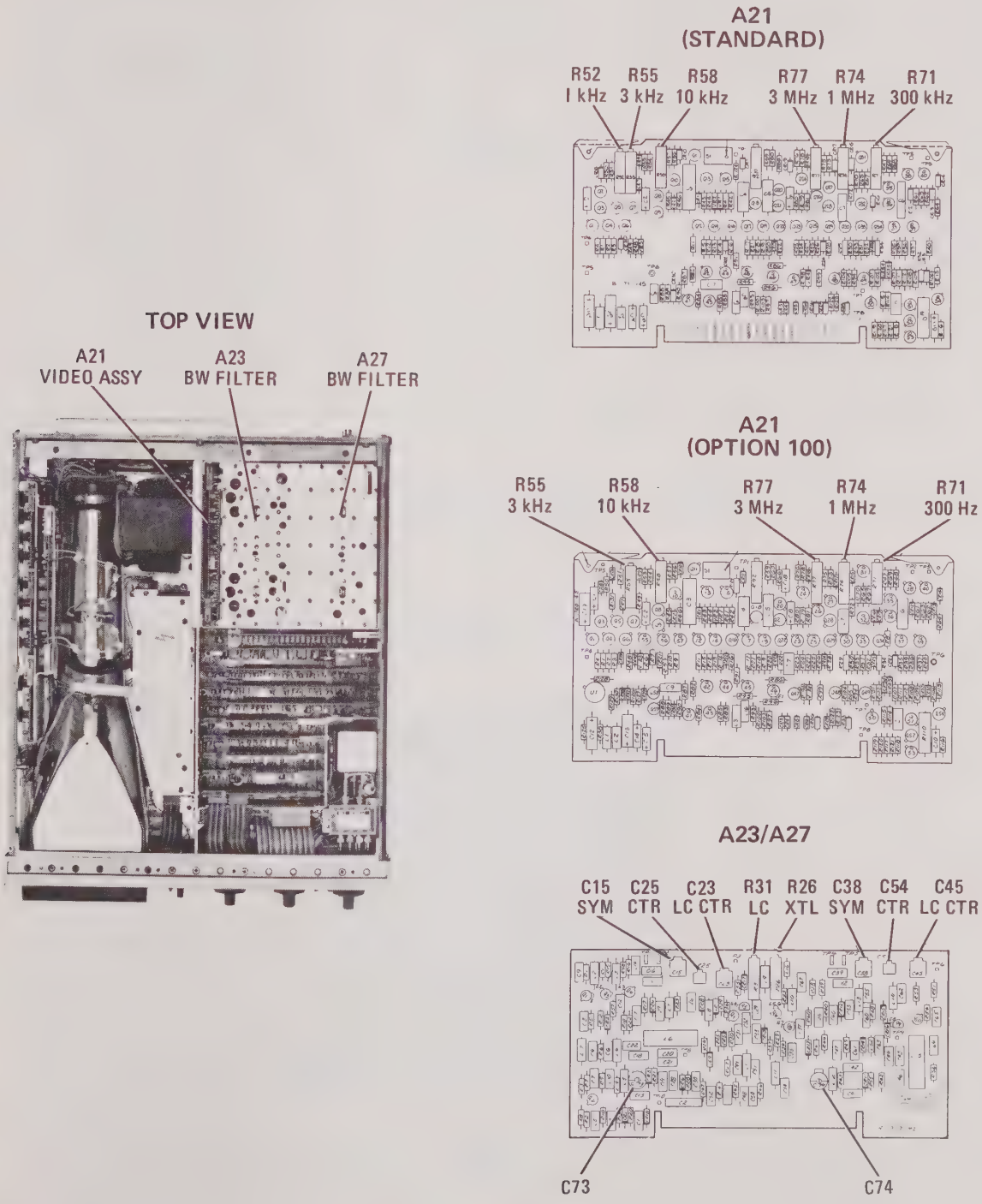


Figure 5-22. Bandwidth Filter Adjustment Locations

5-20. BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

Crystal Alignment

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-20, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	—10
RESOLUTION BW	30 kHz
FREQUENCY SPAN/DIV	20 kHz
AMPLITUDE SCALE	LIN
TUNING	0.100 GHz

c. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector and adjust TUNING control to center 100 MHz signal on CRT display.

d. Connect crystal shorts (through cover access holes) across each pair of the following test points: A23TP1-A23TP2, A27TP1-A27TP2, and A27TP4-A27TP5.

e. Adjust front panel TUNING control to center bandpass spike (Figure 5-23) on CRT display.

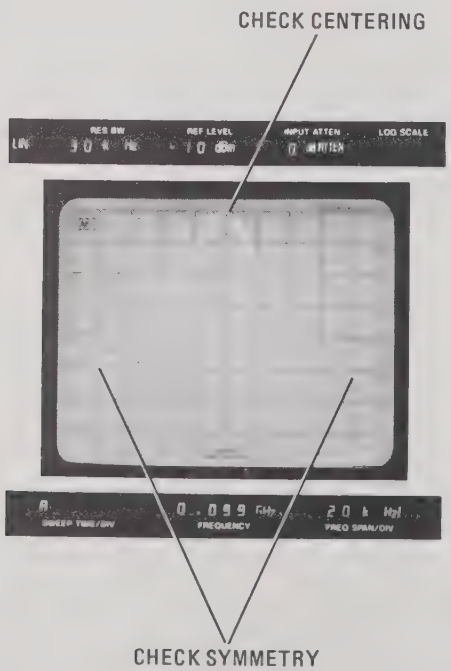


Figure 5-23. Crystal Filter Adjustment CRT Display

5-20. BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

NOTE

A non-metallic tuning tool is required for all crystal filter and LC filter adjustments.

f. Adjust A23C54 CTR and A23C38 SYM (Figure 5-22) for a centered and symmetrical bandpass. Crystal center adjustment A23C54 is adjusted for minimum signal amplitude (Figure 5-23).

g. Remove crystal short across A23TP1 – A23TP2.

h. Adjust A23C25 CTR and A23C15 SYM for a centered and symmetrical bandpass. Crystal center adjust A23C25 is adjusted for minimum signal amplitude (Figure 5-23).

i. Switch AMPLITUDE SCALE to 5 dB and remove crystal short across A27TP4 – A27TP5.

j. Adjust A27C54 CTR and A27C38 SYM for a centered and symmetrical bandpass. Crystal center adjustment A27C54 is adjusted for minimum signal amplitude (Figure 5-23.)

k. Remove crystal short across A27TP1 – A27TP2.

l. Adjust A27C25 CTR and A27C15 SYM for a centered and symmetrical bandpass. Crystal center adjustment A27C25 is adjusted for minimum signal amplitude (Figure 5-23).

LC Alignment

m. Set FREQUENCY SPAN/DIV to 20 kHz and AMPLITUDE SCALE to LIN. Adjust TUNING control to center 100 MHz signal on CRT display, then set RESOLUTION BW control to 3 MHz. Set A21S1 NORM-TEST switch to TEST.

n. Install A23 BW Filter No. 2 Assembly on extender board and perform preliminary LC Filter adjustment as follows:

1. Short to ground the following test points: A23TP6, A27TP3, and A27TP6.

2. Adjust A23C73 for minimum signal amplitude.

3. Disconnect short to ground from A23TP6 and connect short to A23TP3. Adjust A23C74 for minimum signal amplitude.

4. Reinstall A23 and install A27 BW Filter No. 1 Assembly on extender board.

5. Disconnect short to ground from A27TP3 and connect short to A23TP3. Adjust A27C73 for minimum signal amplitude.

6. Disconnect short to ground from A27TP6 and connect short to A27TP3. Adjust A27C74 for minimum signal amplitude.

5-20. BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

7. Remove jumpers to ground and reinstall A27 BW Filter No. 1 Assembly. Replace covers on A23 and A27 BW Filter Assemblies.

NOTE

When A23 and A27 BW Filter Assemblies are installed with covers in place, midget copper alligator clips (HP Part No. 1400-0483) can be used to short test points to the cover.

o. Short to ground A23TP6, A27TP3, and A27TP6. Adjust A23C23 LC CTR to center bandpass display on CRT screen.

p. Disconnect short to ground from A23TP6. Adjust A23C45 LC CTR to center bandpass display on CRT screen.

q. Disconnect short to ground from A27TP3. Short to ground A23TP3 and A23TP6.

r. Adjust A27C23 LC CTR to center bandpass display on CRT screen.

s. Disconnect short to ground from A27TP6. Adjust A27C45 LC CTR to center bandpass display on CRT screen.

t. Disconnect shorts to ground from A23TP3 and A23TP6. Set A21S1 NORM-TEST switch to NORM. Set RESOLUTION BW to 30 kHz and FREQUENCY SPAN/DIV to 2 kHz. Adjust TUNING control to center bandpass display on CRT screen.

u. Switch RESOLUTION BW from 30 kHz to 10 kHz and check signal shift does not exceed 3 kHz (1.5 divisions). If signal shift is out of tolerance, repeat steps b through l. Switch RESOLUTION BW from 30 kHz to 100 kHz and check signal shift does not exceed 10 kHz (5 divisions). If signal shift is out of tolerance, repeat steps m through u.

Bandwidth Amplitude

v. Set RESOLUTION BW to 1 MHz, FREQUENCY SPAN/DIV to 2 kHz, and AUTO STABILIZER on.

w. Adjust FINE TUNING and REF LEVEL FINE for a centered signal with seven division amplitude.

x. Set RESOLUTION BW to 100 kHz and center signal with FINE TUNING control. Adjust A23R26 and A27R26 LC equally to obtain a seven-division amplitude signal.

y. Set RESOLUTION BW to 1 kHz (3 kHz for Option 100) and center signal with FINE TUNING control. Adjust A23R31 and A27R31 XTL equally to obtain a seven-division amplitude signal.

5-20. BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

z. Uncouple RESOLUTION BW and FREQUENCY SPAN/DIV switches. Set FREQUENCY SPAN/DIV to 1 kHz (2 kHz for Option 100) and RESOLUTION BW to 1 kHz (3 kHz for Option 100). (Align green segment on RESOLUTION BW switch with 200 kHz position on FREQUENCY SPAN/DIV switch.) Couple the switches in this positon. Set AMPLITUDE SCALE to 1 dB/DIV.

aa. Center 100 MHz signal with FINE TUNING control and adjust REF LEVEL FINE to obtain a seven-division amplitude signal.

ab. Step RESOLUTION BW switch from 1 kHz (3 kHz for Option 100) to 300 kHz and check amplitude variation from seventh graticule line is less than ±0.5 dB. Check signal amplitude for 300 kHz and 3 MHz RESOLUTION BW positions is within ±0.4 dB of seventh graticule line (1 MHz RESOLUTION BW position was used for amplitude reference in step y and should be on seventh graticule line). If signal amplitude for 300 kHz positon is too low, repeat steps n through u. If signal amplitude for 3 MHz position is too high, check Third Converter bandpass shape according to Paragraph 5-26.

3 dB Bandwidth Adjustments

ac. Set AMPLITUDE SCALE to LIN, RESOLUTION BW to 3 MHz, and FREQUENCY SPAN/DIV to .5 MHz. Adjust REF LEVEL FINE to set signal peak 7.1 divisions above graticule baseline.

NOTE

Adjustment of 3-dB bandwidth for 100 kHz and 30 kHz RESOLUTION BW positions requires changing factory selected resistors. The 100 kHz bandwidth will narrow with an increase in resistor values. The 30 kHz bandwidth will widen with an increase in resistor values. While the resistor values selected for each bandwidth (100 kHz or 30 kHz) do not need to be the same value, they should not vary from each other by more than 10 percent.

NOTE

Option 100 removes the 1 kHz bandwidth adjustment from A21 Video Assembly. For Option 100, the 1 kHz bandwidth adjustment procedure is included with the .3 kHz and .1 kHz bandwidth adjustments in Paragraph 5-33.

ad. Perform 3-dB bandwidth adjustment listed in Table 5-8. Maintain the signal peak 7.1 divisions above graticule baseline, and adjust for correct bandwidth five divisions above graticule baseline. Measure the 3-dB bandwidth with a frequency counter as follows:

1. Set SWEEP SOURCE to MAN, and connect frequency counter to rear panel 21.4 MHz IF OUTPUT connector.

5-20 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

2. Adjust MANUAL SWEEP control to position CRT trace at lower frequency 3 dB point, then upper frequency 3 dB point. Note frequency difference between 3-dB points is within 15% of selected RESOLUTION BW. If not, repeat corresponding 3-dB bandwidth adjustment. (The 3 dB point is 5 divisions above graticule baseline when signal peak is 7.1 divisions above graticule baseline.)

3. Set SWEEP SOURCE to INT.

Table 5-8. 3-dB Bandwidth Adjustments and Limits

RESOLUTION BW	FREQUENCY SPAN/DIV	ADJUSTMENT	3 dB BANDWIDTH LIMITS
3 MHz	.5 MHz	A21R77 3 MHz	2.55 to 3.45 MHz
1 MHz	.2 MHz	A21R74 1 MHz	0.85 to 1.15 MHz
300 kHz	50 kHz	A21R71 300 kHz	255 to 345 kHz
100 kHz	20 kHz	A23R19*, A23R43*, A27R43*	85 to 115 kHz
30 kHz	5 kHz	A23R23*, A23R48* A27R23*, A27R48*	25.5 to 34.5 kHz
10 kHz	2 kHz	A21R58 10 kHz	8.5 to 11.5 kHz
3 kHz	1 kHz	A21R55 3 kHz	2.5 to 3.5 kHz
1 kHz (Except Option 100)	1 kHz	A21R52 1 kHz	0.8 to 1.2 kHz

ae. Adjustment complete, set LINE switch OFF, remove power cord, and install 8565A top cover.

5-21. STEP GAIN ADJUSTMENTS

REFERENCE:

Service Sheet 22

DESCRIPTION:

0 dB and −12 dB adjustments are set to calibrate front panel REF LEVEL FINE control. The Step Gain Amplifier is then adjusted for calibrated 10 dB steps.

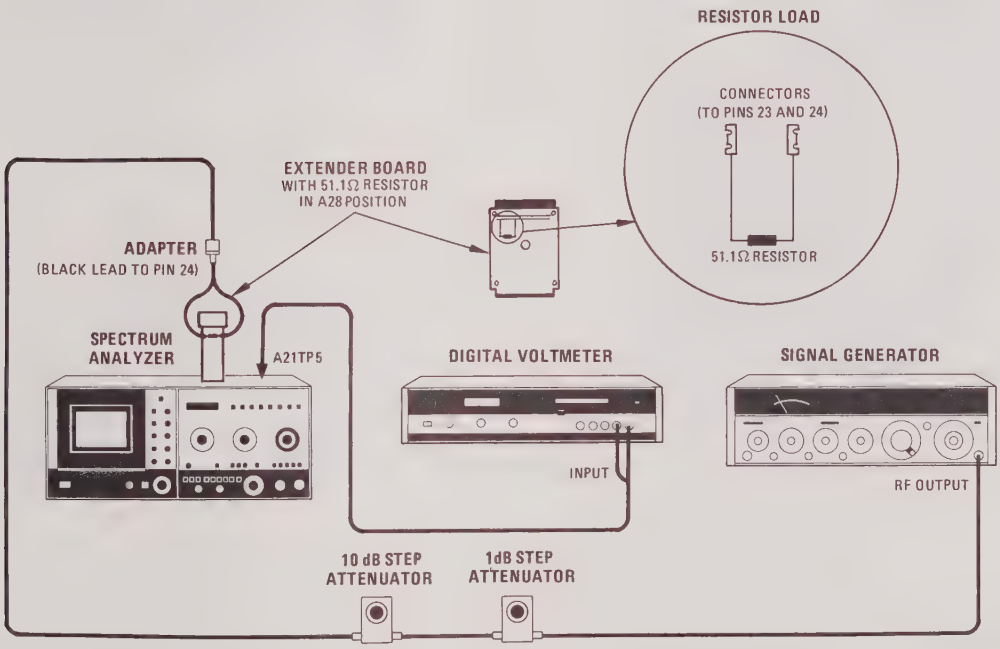


Figure 5-24. Step Gain Adjustment Test Setup

EQUIPMENT:

10 dB Step Attenuator	HP 355D H80
1 dB Step Attenuator	HP 355C H80
Digital Voltmeter	HP 3490A
Signal Generator	HP 8640B
Extender Board (2 x 22 pin)	08565-60107
Resistor 51.1 Ohm	0757-0394
Terminal Connectors (2)	0362-0227
Adapter, BNC Female to Alligator Clips	8120-1292

5-21. STEP GAIN ADJUSTMENTS (Cont'd)

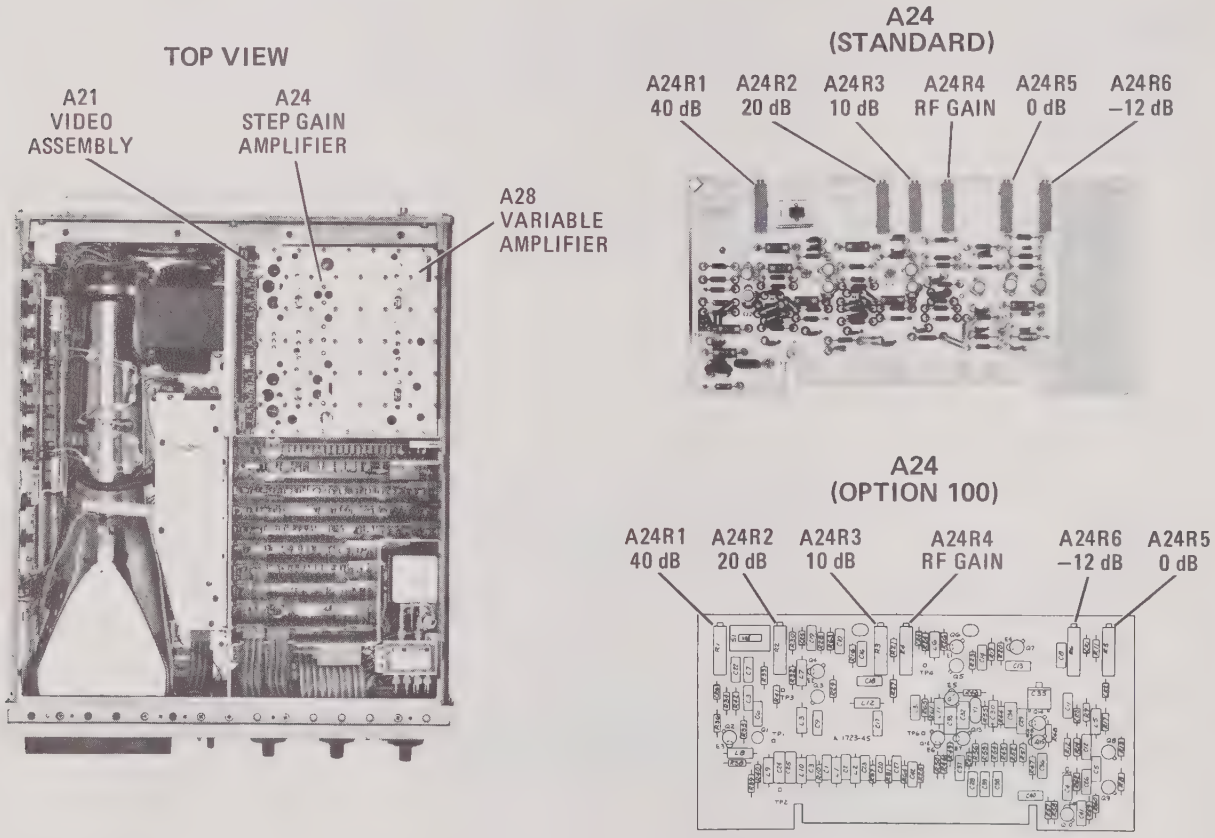


Figure 5-25. Step Gain Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF disconnect power cord, and remove 8565A top cover.

b. Install 51.1 ohm resistor between pins 23 and 24 on extender board (Figure 5-24). Remove A28 Variable Gain Amplifier and install extender board in its place (do not install A28 on extender board).

c. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-24, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

REF LEVEL	0 dBm
REF LEVEL FINE	−12
RESOLUTION BW	1 MHz
AMPLITUDE SCALE	1 dB
VIDEO FILTER	.01

5-21. STEP GAIN ADJUSTMENTS (Cont'd)

d. Set 10 dB step attenuator to 0 dB and 1 dB step attenuator to 12 dB. Set signal generator for a 21.4 MHz, −3 dBm output.

e. Adjust signal generator output frequency for maximum signal level on CRT display.

f. Adjust A24R6 −12 dB (Figure 5-25) for maximum signal level on CRT display. Then adjust A24R6 counterclockwise to set signal level 0.4 division below maximum.

g. Adjust signal generator output level to position CRT trace on REFERENCE LEVEL graticule line.

h. Set REF LEVEL FINE control to 0 dB and 1 dB step attenuator to 0 dB.

i. Adjust A24R5 0 dB to positon CRT trace on REFERENCE LEVEL graticule line.

j. Turn off signal generator RF Power and note offset voltage at A21TP5.

Offset _____ mV

k. Turn on signal generator RF power and set output level to 0 dBm. Adjust A24R4 RF GAIN for 800 mV plus the offset measured at A21TP5 in step j. (If A24R4 does not have sufficient adjustment range, change value of A27R3*. An increase in resistance will decrease voltage at A21TP5.)

l. Perform step gain adjustments for each REF LEVEL and 10 dB step attenuator setting in Table 5-9.

m. Adjustment complete. Set LINE switch OFF, disconnect power cord, remove extender board, install A28 Variable Gain Amplifier Assembly, and install 8565A top cover.

Table 5-9. REF LEVEL Step Gain Adjustment

REF LEVEL	10 dB Step Attenuator	Adjustment	Voltage A21TP5
0 dBm	0 dB	A24R4 GAIN	Reference (800 mV + offset)
−10 dBm	10 dB	A24R3 10 dB	Reference ±20 mV
−20 dBm	20 dB	A24R2 20 dB	Reference ±20 mV
−30 dBm	30 dB	None	Reference ±20 mV
−40 dBm	40 dB	A24R1 40 dB	Reference ±20 mV
−50 dBm	50 dB	None	Reference ±20 mV

5-22. SWEEP GENERATOR ADJUSTMENTS

REFERENCE:

Service Sheet 10

DESCRIPTION:

The +10V Temperature Variable Supply (+10VTV) is adjusted during the first five minutes of instrument operation. The sweep generator is then adjusted to start retrace when the sweep ramp reaches plus five volts. Rear panel HORIZONTAL SWEEP OUTPUT is used to externally sweep an oscilloscope, and a time mark generator is used to calibrate the sweep time.

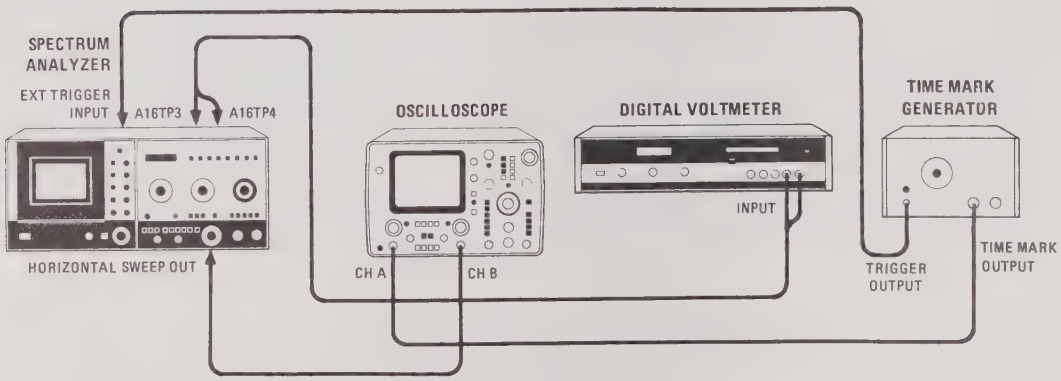


Figure 5-26. Sweep Generator Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter	HP 3490A
Oscilloscope	HP 1740A
Time Mark Generator	HP 226A

5-22. SWEEP GENERATOR ADJUSTMENTS (Cont'd)

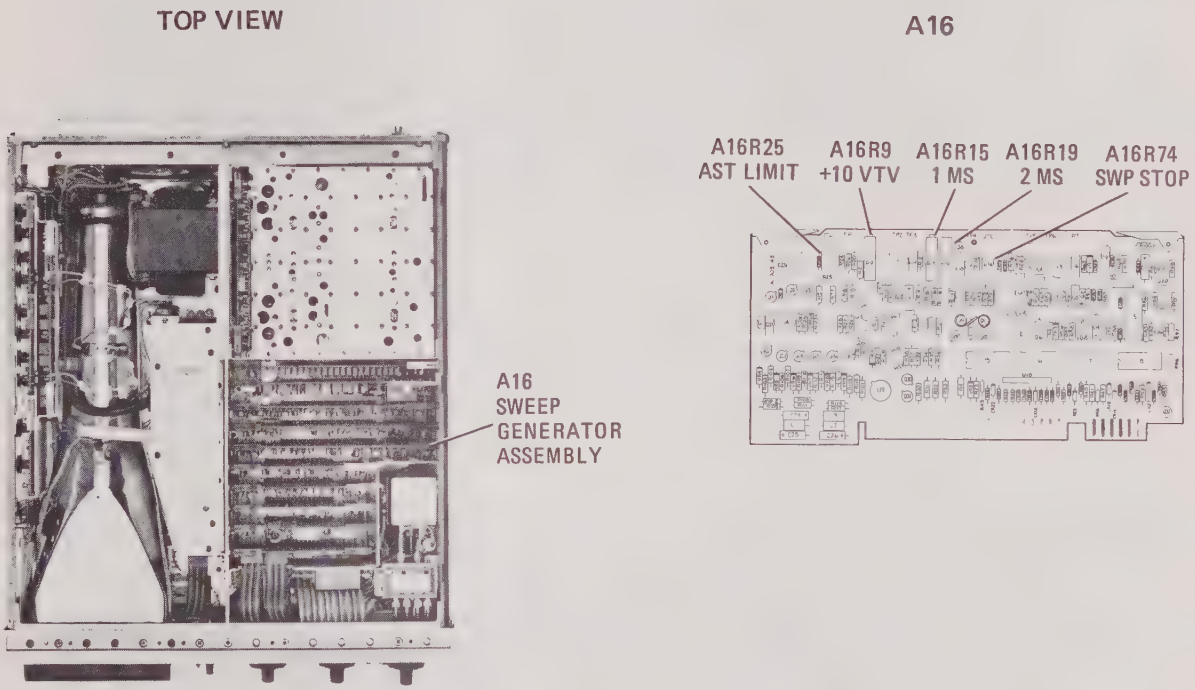


Figure 5-27. Sweep Generator Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-26, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

RESOLUTION BW	10 kHz
FREQUENCY SPAN/DIV	100 MHz
SWEEP TRIGGER	SINGLE

5-22. SWEEP GENERATOR ADJUSTMENTS (Cont'd)

NOTE

The +10V Temperature Variable Supply (+10VTV) must be adjusted while the spectrum analyzer is still cold, during first five minutes of operation. If instrument has been operating, turn off spectrum analyzer and remove A16 Sweep Generator Assembly. Let A16 assembly cool off for 15 Minutes. Replace A16 and proceed with adjustment of A16R9 +10 VTV during first five minutes of operation.

c. Connect digital voltmeter to A16TP3 +10VTV and use A16TP4 for ground return. Adjust A16R9 +10 VTV for +10.00 volts ±0.01 volts.

d. Connect digital voltmeter to A16TP6 INT SWP and use A16TP4 for ground return. Check that voltage at A16TP6 is −5.00 V ±0.02 V. If not, perform +15 volt adjustment in Paragraph 5-12.

NOTE

Adjustment of A16R74 SWP STOP (Figure 5-27) is performed by noting the sweep ramp voltage just prior to sweep retrace. A16R74 is then adjusted to trigger sweep retrace when the sweep ramp reaches +5 volts. To accurately determine sweep ramp voltage, slow sweep time per division by setting VIDEO FILTER to .003 when CRT trace is within one-half division of right graticule edge.

e. Depress START/RESET pushbutton to start sweep. When trace is within one-half division of right graticule edge, set VIDEO FILTER to .003. Note digital voltmeter indication just prior to sweep retrace (maximum positive sweep ramp voltage).

f. Adjust A16R74 SWP STOP for a maximum sweep ramp voltage (step e) of +5.00 volts ±0.01 volts. A clockwise adjustment of A16R74 will increase the sweep ramp voltage required to trigger retrace.

g. Set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 – 1.8
INPUT ATTEN	10 dB
REF LEVEL	10 dBm
REF LEVEL FINE	0
RESOLUTION BW	3 MHz
FREQUENCY SPAN/DIV	500 MHz
SWEEP TIME/DIV	1 mSEC

5-22. SWEEP GENERATOR ADJUSTMENTS (Cont'd)

NOTE

The HP 1740A oscilloscope is externally swept by selecting A→B sweep mode and connecting 8565A HORIZONTAL SWEEP OUT to oscilloscope Channel B input connector. Oscilloscope horizontal gain is adjusted with Channel B VOLTS/DIV control.

h. Externally sweep oscilloscope with rear panel HORIZONTAL SWEEP OUT and adjust oscilloscope horizontal gain for a ten division wide trace.

i. Set time mark generator for 1 millisecond marker output and display output on oscilloscope. Externally trigger spectrum analyzer with time marker generator.

j. Adjust spectrum analyzer TRIGGER LEVEL to set first peak on left edge of oscilloscope graticule display (Figure 5-28). Adjust A16R15 1 MS to set eleventh peak on right edge of graticule display.

k. Set spectrum analyzer SWEEP TIME/DIV to 2 mSEC and time mark generator output to 2 milliseconds.

l. Adjust spectrum analyzer TRIGGER LEVEL to set first peak on left edge of oscilloscope graticule display. Adjust A16R19 2 MS to set eleventh peak on right edge of graticule display. Repeat steps i through l until no further adjustment is necessary.

m. Set spectrum analyzer SWEEP TIME/DIV to AUTO and time mark generator output to 50 milliseconds.

n. Adjust spectrum analyzer TRIGGER LEVEL to set first peak on left edge of graticule display. Adjust A16R25 AST LIMIT to set sixth peak on right edge of graticule display.

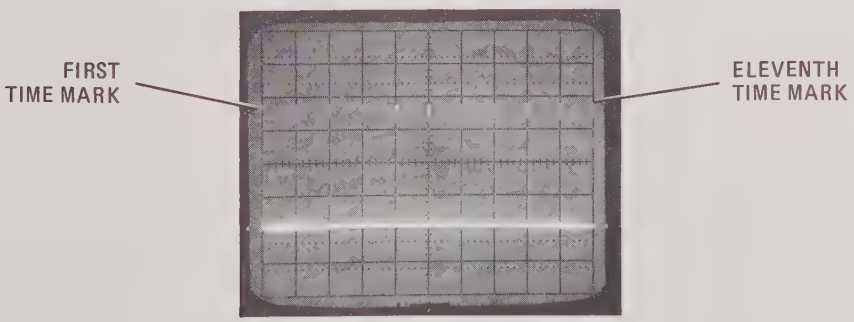


Figure 5-28. Time Mark Oscilloscope Display

o. Adjustment complete. Set LINE switch OFF, disconnect power cord and install 8565A top cover.

ADJUSTMENTS

5-23. +10 V REFERENCE AND DIGITAL READOUT ADJUSTMENTS

REFERENCE:

Service Sheets 12, 17, and 35

DESCRIPTION:

Adjustment of the A17 Frequency Control Assembly +10V reference supply is performed, and offset in the center frequency output (to A12 DVM Analog Assembly) is adjusted for a null. The A12 DVM Analog Assembly is then adjusted to give a calibrated front panel CENTER FREQUENCY digital readout. Digit intensity on the bezel readout display is adjusted for the same intensity as that of the bezel readout annunciators.

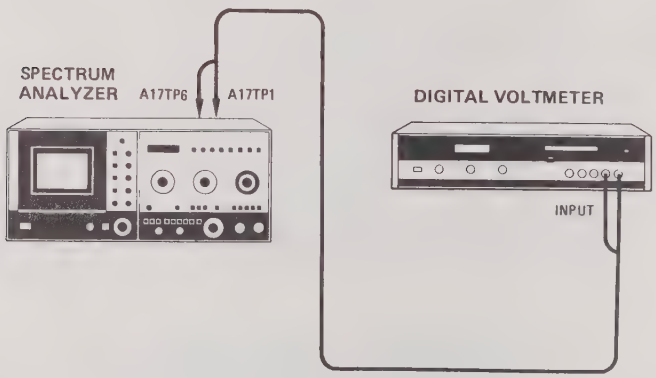


Figure 5-29. +10V Reference and Digital Readout Adjustments Test Setup

EQUIPMENT:

Digital Voltmeter ..... HP 3490A

5-23. +10 V REFERENCE AND DIGITAL READOUT ADJUSTMENTS (Cont'd)

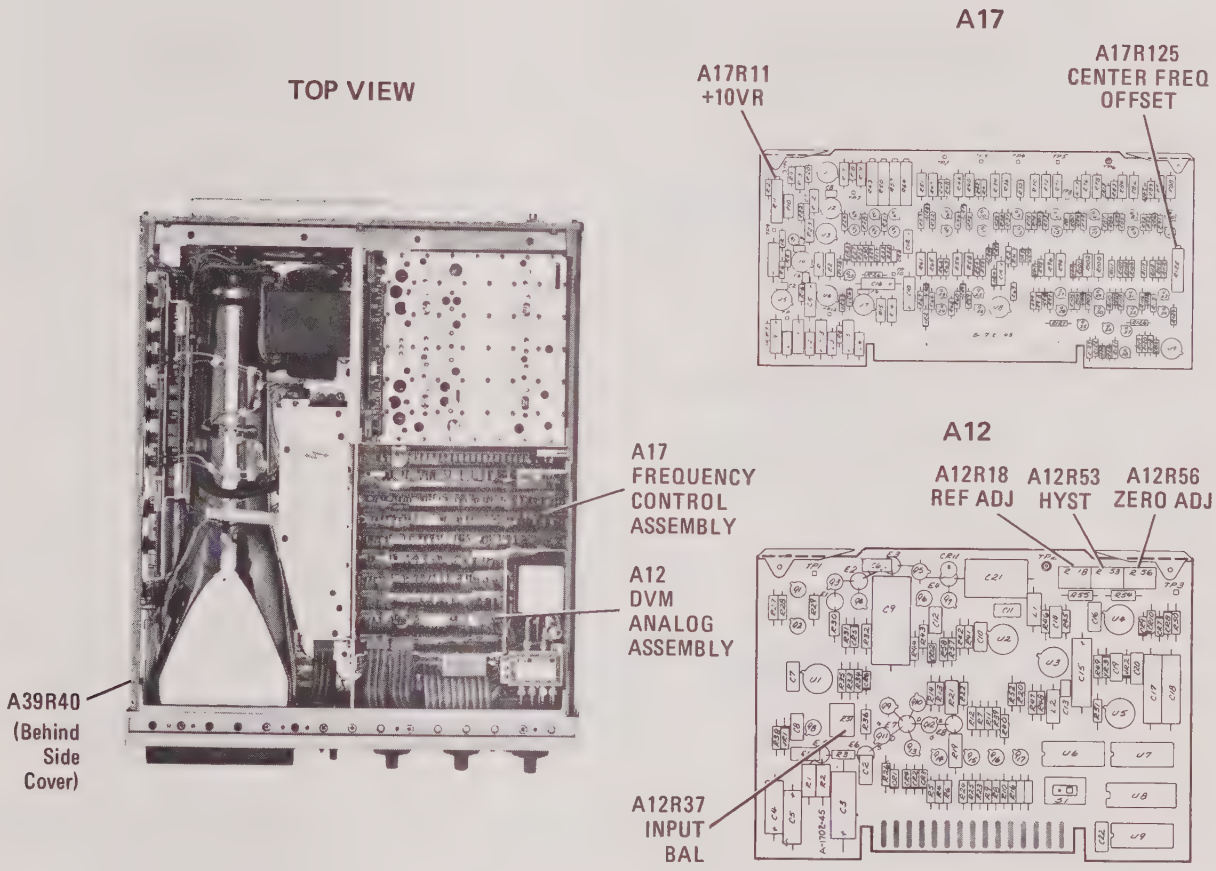


Figure 5-30. +10V Reference and Digital Readout Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-29, and set 8565A controls as follows:

Set all normal settings (controls marked with green)

FREQUENCY BAND GHz ..... .01—1.8

ADJUSTMENTS

5-23. +10 V REFERENCE AND DIGITAL READOUT ADJUSTMENTS (Cont'd)

NOTE

For all digital voltmeter measurements, use A17TP6 ⏚ for ground return.

+10V Reference Adjustment

c. Connect digital voltmeter to A17TP1 +10VR and adjust A17R11 +10VR (Figure 5-30) for +10.0000V ± 0.0002V. If unable to adjust A17R11 for +10 V, change factory selected resistor A17R9*. Decrease in A17R9* decreases voltage.

d. Jumper A17TP5 CENT FREQ to A17TP8 and connect digital voltmeter to A17TP5 CENT FREQ.

e. Adjust A17R125 CENTER FREQ OFFSET for a digital voltmeter reading of 0.0000V ±0.0002V.

f. Disconnect jumper between A17TP5 CENT FREQ and A17TP8.

Digital Readout Adjustment

g. Install A12 DVM Analog Assembly on extender board and connect jumper between A12E7 and A12TP2. Connect digital voltmeter to A12TP1.

h. Adjust A12R37 INPUT BAL for a digital voltmeter reading of 0.000V ± 0.001V. Reinstall A12 DVM Analog Assembly.

i. Adjust front panel TUNING control for a 0.0000 V ±0.0001V digital voltmeter reading at A17TP5 CENT FREQ.

j. Adjust A12R56 ZERO ADJ for a flickering minus sign on the front panel CENTER FREQUENCY digital readout.

k. Adjust TUNING control for a 0.0005V ± 0.0001V digital voltmeter reading at A17TP5 CENT FREQ.

l. Adjust A12R53 HYST for a CENTER FREQUENCY display flickering between 0.000 GHz and 0.001 GHz.

m. Switch FREQUENCY BAND to 8.5 – 18 GHz and adjust front panel TUNING control for 10.0000V ±0.0002V at A17TP5 CENT FREQ.

n. Adjust A12R18 REF ADJ for a CENTER FREQUENCY display of 10.000 GHz.

Bezel Readout Digit Intensity Adjustment

o. Adjust A39R40 DIG INT for equal intensity of digits and annunciators on bezel digital readout display. (A39R40 is accessible through vent holes in instrument side cover).

p. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-24. YIG DRIVER ADJUSTMENT

REFERENCE:

Service Sheet 14

DESCRIPTION

The YIG Tuned Oscillator (YTO) output frequency is calibrated by supplying a known tuning voltage and adjusting YTO offset and gain adjustments for the correct 1st Local Oscillator output frequency. The YIG Tuned Filter (YTF) offset and gain adjustments are performed to track the YTF bandpass with the YTO frequency.

NOTE

Allow at least 1 hour warm-up before performing YIG Driver Adjustments.

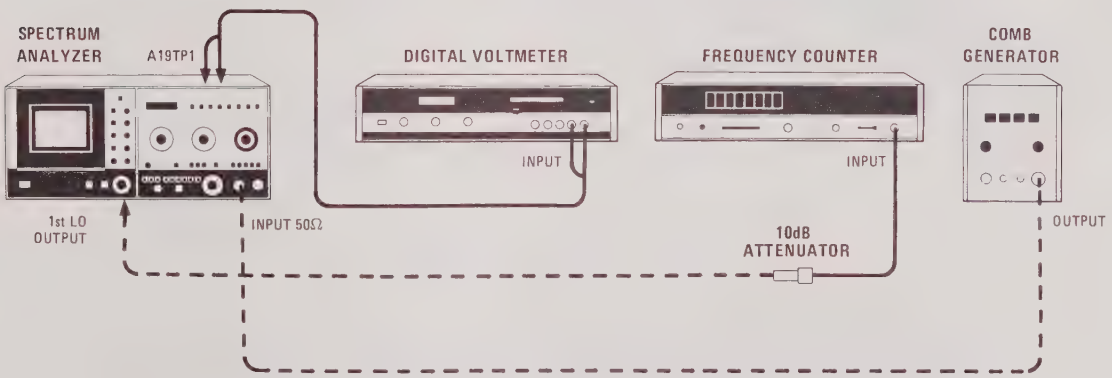


Figure 5-31. YIG Driver Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter	HP 3490A
Frequency Counter	HP 5340A
Comb Generator	HP 8406A
10 dB Attenuator	HP 8491B Option 010

5-24. YIG DRIVER ADJUSTMENT (Cont'd)

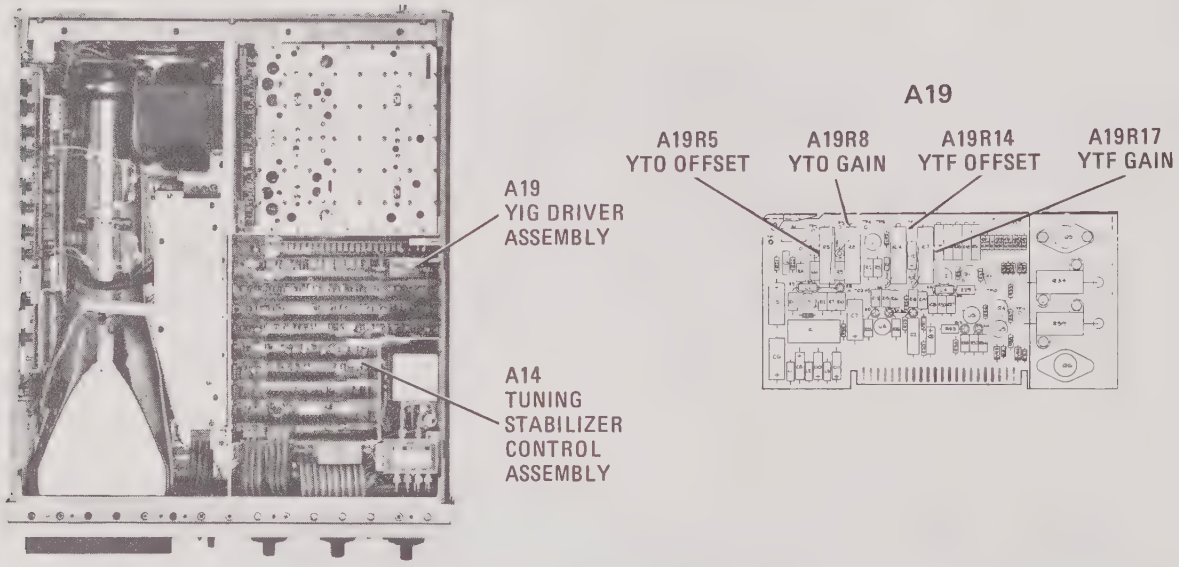


Figure 5-32. YIG Driver Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, remove 8565A top cover, and remove A14 Tuning Stabilizer Control Assembly.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-31, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)
FREQUENCY BAND GHz ..... 1.7 – 4.1
FREQUENCY SPAN MODE ..... ZERO SPAN
AUTO STABILIZER ..... OFF

NOTE

For all digital voltmeter measurements, use A19TP1 ▽2 for return.

YTO Adjustments

c. Connect frequency counter through a 10 dB attenuator to rear panel 1ST LO OUTPUT connector.

5-24. YIG DRIVER ADJUSTMENT(Cont'd)

d. Connect digital voltmeter to A19TP4 YTO FA and adjust front panel TUNING control for −10.2500V ±0.0005V.

e. Adjust A19R5 YTO OFFSET (Figure 5-32) for a frequency counter reading of 2.050 GHz ±0.0002 GHz.

f. Adjust front panel TUNING control for −22.000V ±0.001V at A19TP4 YTO FA.

g. Adjust A19R8 YTO GAIN for a frequency counter reading of 4.400 GHz ±0.001 GHz.

h. Adjust front panel TUNING control for −10.2500V ± 0.005V at A19TP4 YTO FA and check frequency at 1ST LO OUTPUT. Frequency should be 2.050 GHz ± 0.001 Ghz. If not within tolerance, repeat steps e through g.

Preliminary YTF Tracking Adjustment

i. Install 50-ohm load on rear panel 1ST LO OUTPUT connector, connect 100 MHz comb generator output to front panel INPUT 50Ω, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	1.7—4.1
INPUT ATTEN	0 dB
RESOLUTION BW	3 MHz
FREQUENCY SPAN/DIV	200 MHz
FREQUENCY SPAN MODE	ZERO SPAN
AUTO STABILIZER	OFF
VIDEO FILTER	.3
TUNING	2.000 GHz

NOTE

The following procedure is a preliminary YTF tracking check and adjustment. If a tracking adjustment is required, also perform adjustments in Paragraph 5-30 YTF Tracking Adjustment.

j. Set A19S1 YTF TRACK switch to TEST and ensure front panel PRESELECTOR PEAK control is set to center of green area.

k. Adjust front panel TUNING control to peak signal on CRT display. Remove hysteresis by switching to FULL BAND then back to ZERO SPAN (FREQUENCY SPAN MODE) and repeak signal on CRT display.

l. Adjust A19R14 YTF OFFSET to center passband on CRT display (Figure 5-33).

m. Set FREQUENCY BAND GHz to 5.8—12.9. Tune spectrum analyzer to 10.0 GHz and peak signal on CRT display. Remove hysteresis by switching to FULL BAND then back to ZERO SPAN (FREQUENCY SPAN MODE) and repeak signal on CRT display.

n. Adjust A19R17 YTF GAIN to center passband on CRT display (Figure 5-33).

5-24. YIG DRIVER ADJUSTMENT (Cont'd)

o. If tracking adjustment was required, perform adjustments in Paragraph 5-30. If not, set A19S1 YTF TRACK switch to NORM. Set LINE switch OFF, disconnect power cord, and install A14 Tuning Stabilizer Control Assembly. Install 8565A top cover.

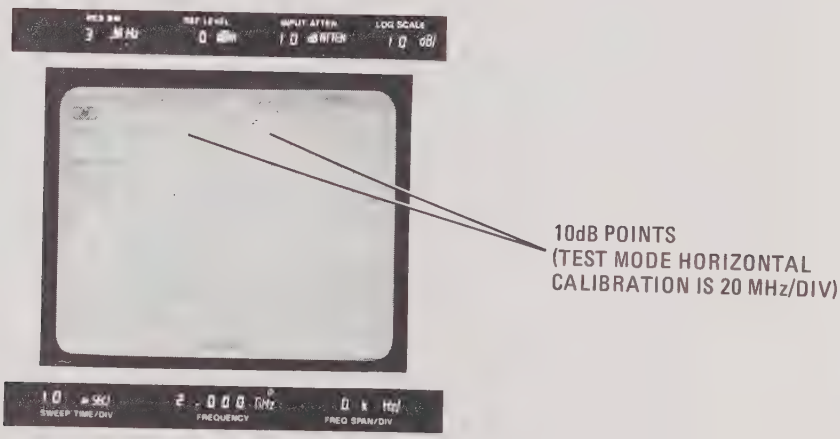


Figure 5-33. YTF Passband Display for YIG Driver Adjustment

5-25. SECOND CONVERTER ADJUSTMENT

REFERENCE:

Service Sheet 7

DESCRIPTION:

The second converter L.O. is adjusted for 1728.60 MHz and the second converter bandpass filter is adjusted for a 2050 MHz bandpass. If the second converter bandpass filter requires significant frequency tuning for correct bandpass adjustment, then the coarse bandpass adjustment must be performed to ensure correct second converter bandpass alignment. Once the second converter bandpass filter is tuned to 2050 MHz, adjustments are performed for compromise of best bandpass shape and minimum conversion loss.

5-25. SECOND CONVERTER ADJUSTMENT (Cont'd)

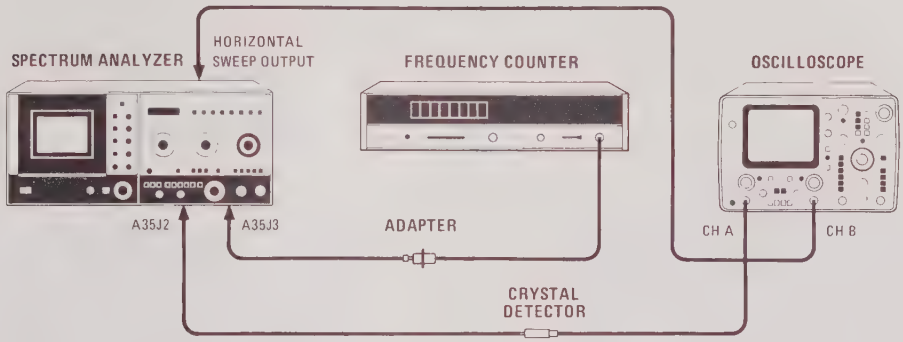


Figure 5-34. Second Converter Adjustment Test Setup

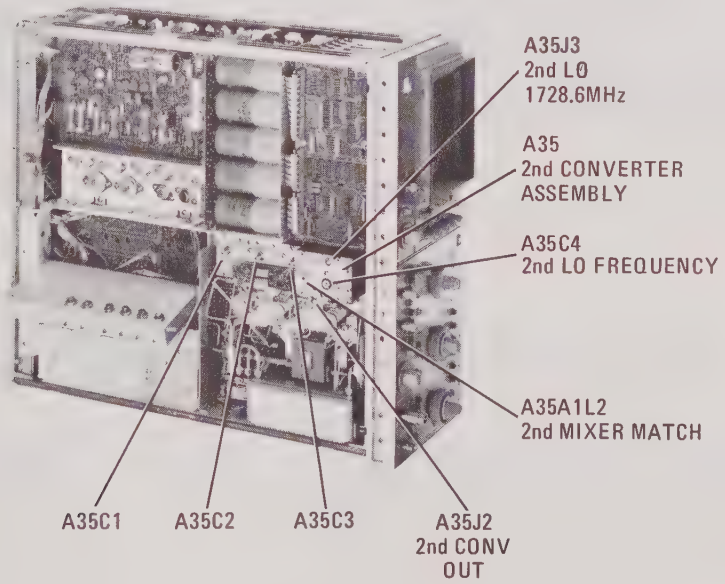


Figure 5-35. Second Converter Adjustment Locations

EQUIPMENT:

Frequency Counter	HP 5340A
Oscilloscope	HP 1740A
Crystal Detector	HP 33330C
Adapter, BNC female to SMC female (modified)	HP Part No. 08565-60087

5-25. SECOND CONVERTER ADJUSTMENT (Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, connect equipment as shown in Figure 5-34, and remove 8565A bottom cover.

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01—1.8
RESOLUTION BW (coupled)	100 kHz
FREQUENCY SPAN/DIV	5 MHz
SWEEP SOURCE	EXT
TUNING	0.000 GHz

c. Connect frequency counter through modified adapter (HP Part No. 08565-60087) to A35J3 2ND LO (Figure 5-35) and adjust A35C4 2ND LO FREQUENCY for 1728.60 MHz ±0.1 MHz.

d. Disconnect frequency counter, set 8565A SWEEP SOURCE to INT, and use TUNING control to center L.O. signal (0.000 GHz) on CRT display.

e. Externally sweep oscilloscope (dc coupled input) with spectrum analyzer HORIZONTAL SWEEP OUTPUT. Adjust oscilloscope horizontal position and gain controls to provide an oscilloscope trace that just fills the 10 horizontal divisions on graticule display.

f. Disconnect W18 from A35J2 2ND CONV OUT and connect oscilloscope (dc coupled input) through a crystal detector to A35J2 2ND CONV OUT. Set oscilloscope sensitivity to 0.01V/DIV.

NOTE

This procedure uses a negative polarity crystal detector. If a positive polarity crystal detector is used the waveforms in Figure 5-36 will be inverted.

g. Check second converter bandpass display on oscilloscope CRT (Figure 5-36a). If center of second converter bandpass is within two divisions of being centered on oscilloscope display, proceed to Second Converter Fine Bandpass Adjustment (step h). If center of bandpass is greater than two divisions from center of oscilloscope display, perform second converter coarse bandpass adjustment as follows:

1. Set FREQ SPAN/DIV to 50 MHz and loosen lock nut on A35C1 and A35C3. Carefully turn tuning screws clockwise until they bottom on cavity.

2. Turn A35C1 and A35C3 one turn counterclockwise and lightly tighten lock nuts.

3. Carefully set A35A1L2 2ND MIXER MATCH fully clockwise, then adjust it two turns counterclockwise.

4. Tune A35C2 to position signal at center of oscilloscope display (this will be a dip of approximately 0.2 divisions).

5-25. SECOND CONVERTER ADJUSTMENT (Cont'd)

5. Set FREQUENCY SPAN/DIV to 5 MHz and adjust A35C1 for maximum negative signal at center of oscilloscope display.

6. Adjust A35C3 and A35A1L2 for maximum negative signal at center of oscilloscope display.

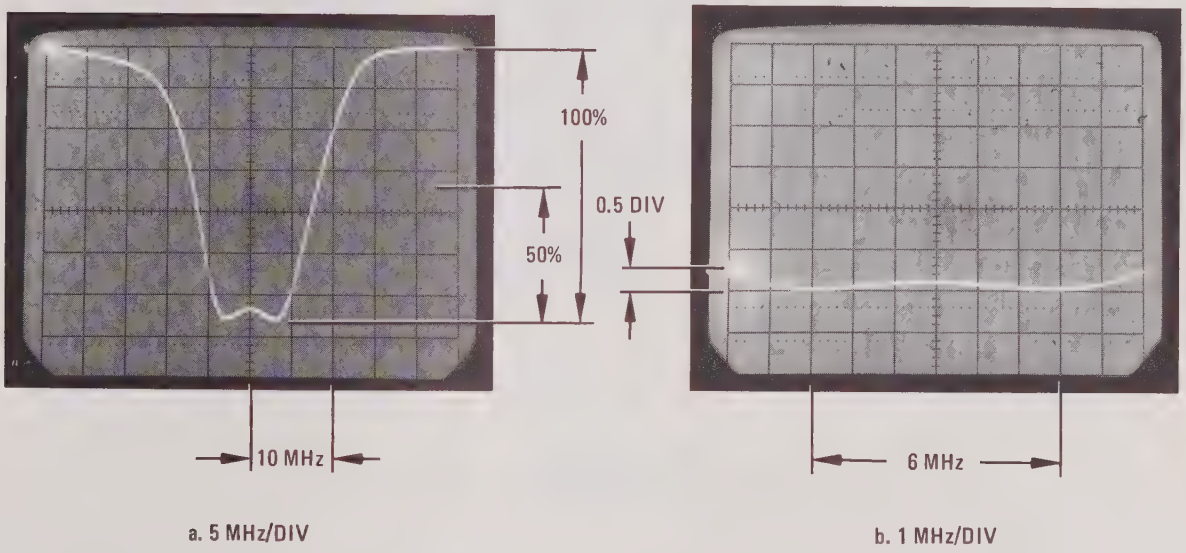


Figure 5-36. Second Converter Bandpass Displays

h. Repetitively adjust in small increments A35C1, A35C2, A35C3, and A35A1L2 for a centered, symmetrical, and flat bandpass display with maximum amplitude as shown in Figure 5-36a. A slight amount of signal amplitude must be sacrificed in order to obtain the desired bandwidth, symmetry, and flatness.

i. Check that right bandpass skirt is at least 50 percent down at a point 10 MHz from center frequency. (See Figure 5-36a.)

j. Adjust oscilloscope vertical gain for a 4-division peak-to-peak display and set FREQUENCY SPAN/DIV to 1 MHz.

k. Check flatness of bandpass within 3 MHz (3 divisions) each side of center. (See Figure 5-36b.) Bandpass should be flat within 0.5 divisions (1 dB).

l. Adjustment complete. Set LINE switch OFF, disconnect power cord, reconnect W18, and install 8565A bottom cover.

5-26. THIRD CONVERTER ADJUSTMENT

REFERENCE:

Service sheet 8

DESCRIPTION:

The third converter L.O. is adjusted for maximum output power and the front panel CAL OUTPUT is calibrated for −10 dBm. A spectrum analyzer is used to display the 300 MHz local oscillator signal at the 21.4 MHz output port, and the 300 MHz bandpass filter is adjusted for maximum 300 MHz local oscillator signal. The 321.4 MHz bandpass filter is checked with an oscilloscope. If the resonant cavities are not closely tuned to 321.4 MHz, the bandpass filter must be detuned and each cavity tuned to 321.4 MHz.

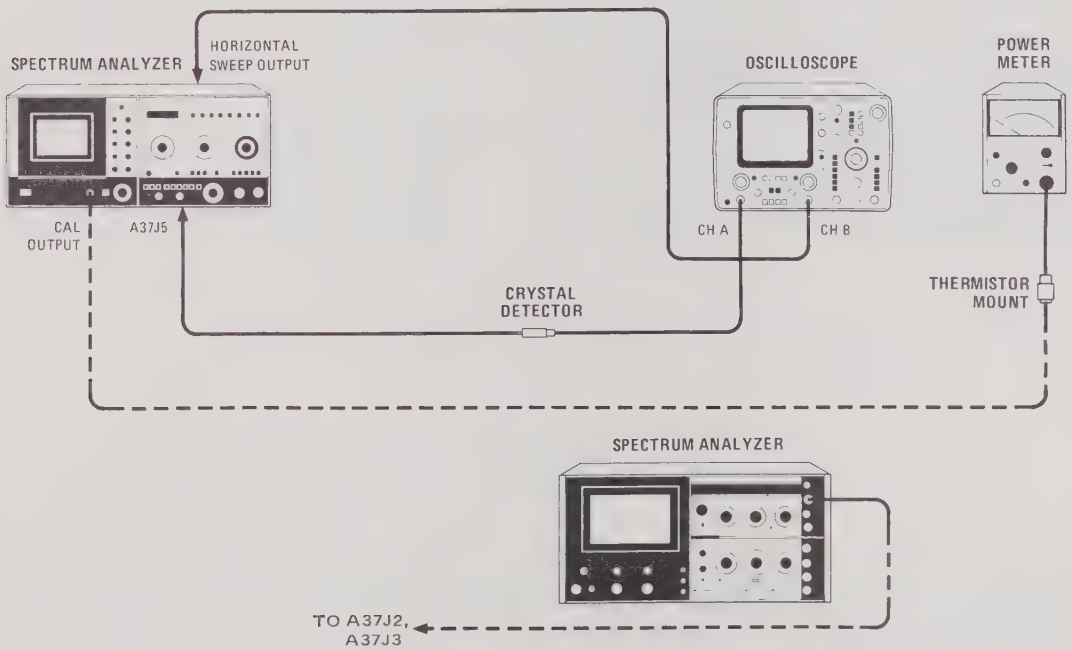


Figure 5-37. Third Converter Adjustment Test Setup

EQUIPMENT:

Oscilloscope	HP 1740A
Spectrum Analyzer	HP 140T/8552B/8554B
Power Meter	HP 432A
Thermistor Mount	HP 8478B
Crystal Detector	HP 33330C

5-26. THIRD CONVERTER ADJUSTMENT (Cont'd)

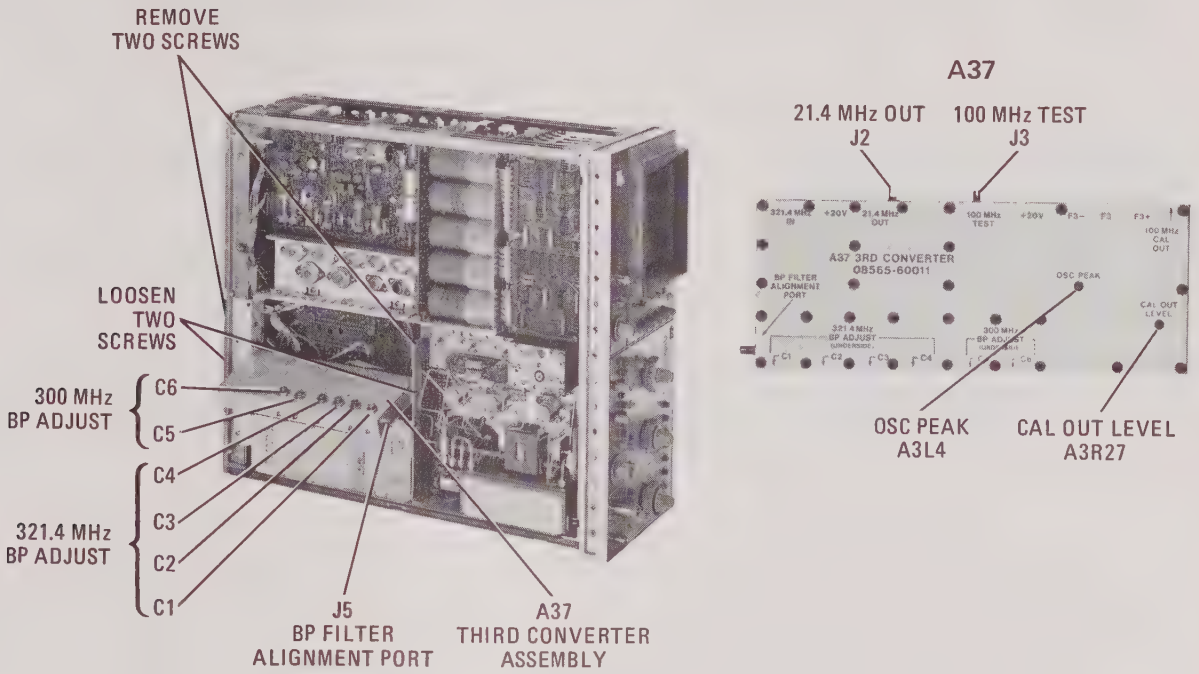


Figure 5-38. Third Converter Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top and bottom covers.

b. Remove two screws and loosen two screws (Figure 5-38) and tilt out A37 Third Converter Assembly.

c. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-37, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
FREQUENCY	0.050 GHz
RESOLUTION BW	100 kHz
FREQ SPAN/DIV	5 MHz

d. Connect test spectrum analyzer to A37J3 100 MHz TEST. Adjust A37A3L4 OSC PEAK for maximum 100 MHz signal level (use non-metallic adjusting tool). Disconnect test spectrum analyzer.

e. Connect power meter to front panel CAL OUTPUT connector. Adjust A37A3R27 CAL OUT LEVEL for −10 dBm. Disconnect power meter.

5-26. THIRD CONVERTER ADJUSTMENT (Cont'd)

f. Disconnect W22 from A37J2 21.4 MHz OUT and connect test spectrum analyzer to A37J2 21.4 MHz OUT.

g. Tune test spectrum analyzer to display 300 MHz local oscillator signal.

h. Iteratively tune A37C5 and A37C6 300 MHz BP ADJUST for maximum 300 MHz signal (Third Converter cover must be installed).

i. Disconnect test spectrum analyzer and reconnect W22 to A37J2 21.4 MHz OUT.

j. Use TUNING control to center L.O. signal (0.000 GHz) on CRT display.

k. Externally sweep oscilloscope (dc coupled input) with spectrum analyzer HORIZONTAL SWEEP OUTPUT. Adjust oscilloscope horizontal position and gain for an oscilloscope trace that just fills the 10-division graticule display. Connect oscilloscope (dc coupled input) through a crystal detector to A37J5 BP FILTER ALIGNMENT PORT connector. Set oscilloscope sensitivity to 0.002V/DIV.

NOTE

This procedure uses a negative polarity crystal detector. If a positive polarity crystal detector is used the waveforms in Figure 5-39 will be inverted.

l. Check oscilloscope display is symmetrical as shown in Figure 5-39d. If not, perform 321.4 MHz coarse bandpass adjustment as follows (Third Converter cover must be installed):

1. Loosen lock nuts on A37C2, A37C3, and A37C4. Carefully turn tuning screws clockwise until they are flush with lock nuts.

2. Adjust A37C1 for a dip at center of oscilloscope display as shown in Figure 5-39a).

3. Adjust A37C2 for a peak at center of oscilloscope display as shown in Figure 5-39b).

4. Adjust A37C3 for dip at center of oscilloscope display as shown in Figure 5-39c).

5. Adjust A37C4 for peak at center of oscilloscope display as shown in Figure 5-39d).

5-26. THIRD CONVERTER ADJUSTMENT (Cont'd)

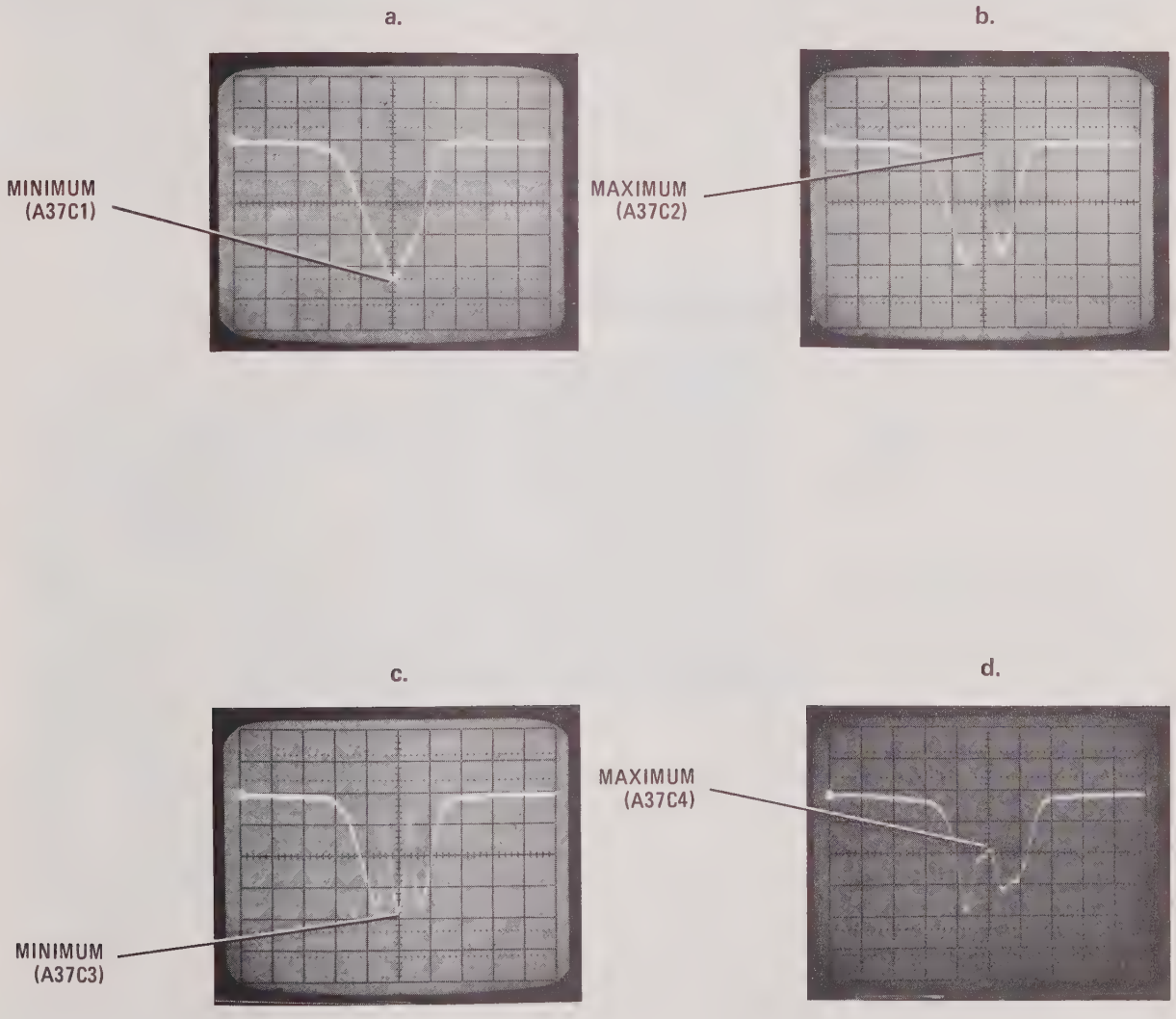


Figure 5-39. 321.4 MHz Bandpass Filter Alignment Oscilloscope Display

m. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω and set 8565A controls as follows:

RESOLUTION BW	3 MHz
FREQ SPAN/DIV	2 MHz
FREQUENCY	0.100 GHz

5-26. THIRD CONVERTER ADJUSTMENT (Cont'd)

n. Check 100 MHz signal on spectrum analyzer display has a symmetrical bandpass. A typical bandpass shape is shown in Figure 5-40. If bandpass symmetry is worse than shown in Figure 5-40, small adjustments of A37C1 through A37C4 should be performed to improve bandpass shape. However, do not sacrifice more than 1 dB of signal amplitude when adjusting for best bandpass shape (loss of signal amplitude reduces instrument sensitivity).

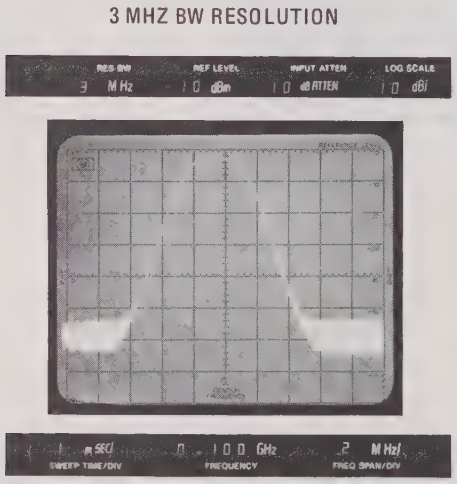


Figure 5-40. 321.4 MHz Bandpass Filter Alignment Spectrum Analyzer Display

o. Adjust 3 dB bandwidth for the 3 MHz RESOLUTION BW switch position according to adjustment procedure in Paragraph 5-20 Bandwidth Filter Adjustment (Table 5-8).

p. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top and bottom covers.

5-27. SWEEP ATTENUATOR ADJUSTMENT

REFERENCE:

Service Sheet 11

DESCRIPTION:

The MAIN SWP OFFSET is adjusted in the Sweep Attenuator Assembly so that a signal at center screen does not shift as FREQUENCY SPAN/DIV is switched between 5 MHz and 2 MHz. This adjustment is necessary because the sweep is applied to the YTO Main Coil for frequency spans ≥ 5 MHz/DIV and to the YTO Tickler Coil for frequency spans ≤ 2 MHz/DIV.

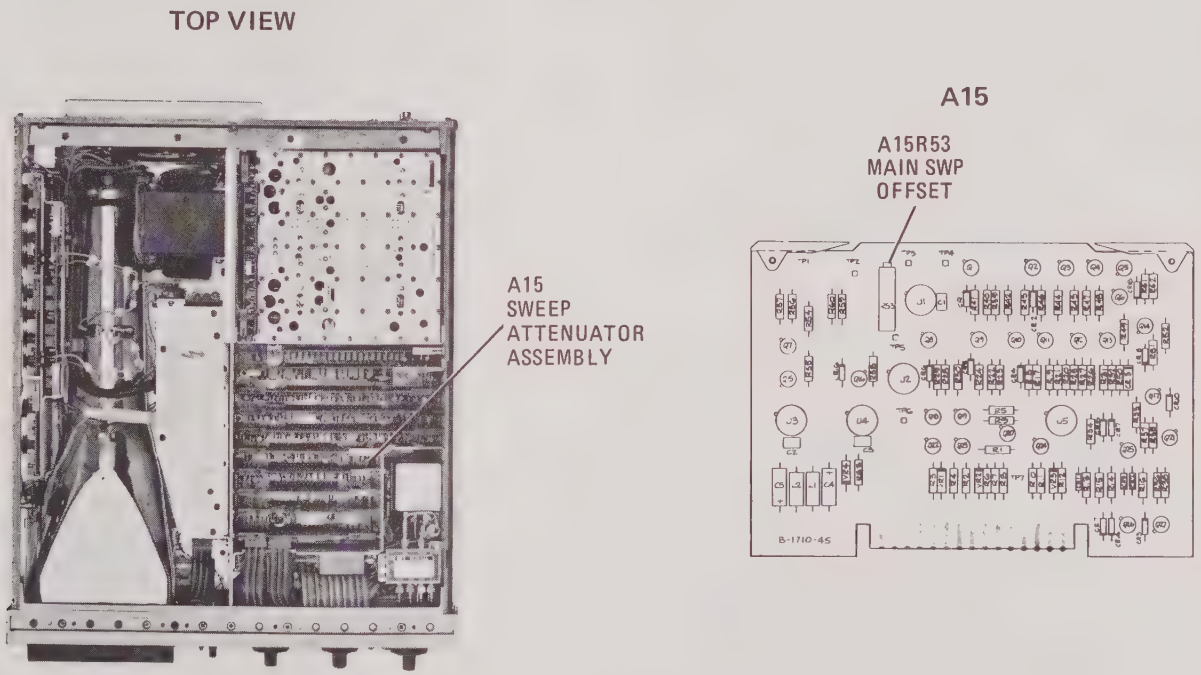


Figure 5-41. Sweep Attenuator Adjustment Location

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

5-27. SWEEP ATTENUATOR ADJUSTMENT (Cont'd)

b. Reconnect power cord, set LINE switch ON, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 — 1.8
RESOLUTION BW	100 kHz
FREQUENCY SPAN/DIV	2 MHz
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0

c. Simultaneously depress INT and EXT SWEEP SOURCE pushbuttons to obtain a dot on CRT display. Adjust front panel HORIZ POSN to position dot on center vertical graticule line.

d. Depress INT SWEEP SOURCE pushbutton to obtain swept CRT trace. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω and adjust TUNING control to center 100 MHz signal on CRT display.

e. Switch FREQUENCY SPAN/DIV to 5 MHz and adjust A15R53 MAIN SWP OFFSET (Figure 5-41) to center 100 MHz signal on CRT display.

f. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS

REFERENCE:

Service Sheets 15 and 16

DESCRIPTION:

The A14 Tuning Stabilizer Control assembly adjustments are performed to set up the correct sweep voltages for the YTO tickler coil and Voltage Controlled Crystal Oscillator (VCXO). A14R68 FET OFFSET is adjusted to provide a zero level output to the tuning stabilizer with the spectrum analyzer operating in zero span mode and a zero volt input from front panel FINE TUNING control. A 50 MHz signal with 100 kHz frequency modulation is displayed on the spectrum analyzer and A14R71 TICK SWEEP is adjusted for a modulation peak occuring every division (FREQ SPAN/DIV set to 100 kHz). The spectrum analyzer is then stabilized and A14R57 VCXO SWP is adjusted for the same sweep display as the TICK SWEEP adjustment. The VCXO is then checked for linearity. The VCXO ERROR OUT signal is monitored, and if the variation of the signal is within limits, no adjustments to the VCXO are necessary. If the error signal is out of tolerance, perform the adjustments in the order given. Small adjustments should be made and the AUTO STABILIZER switched OFF then on after each adjustment to remove the dc component introduced by the adjustment.

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

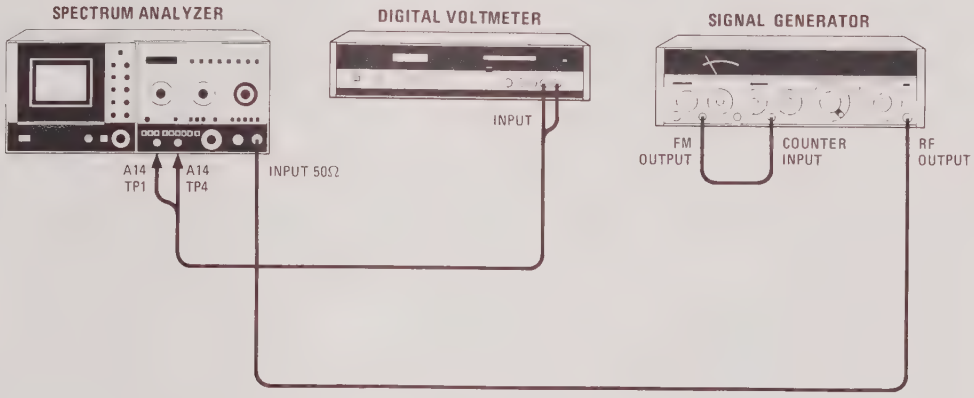


Figure 5-42. Tuning Stabilizer Control Adjustment Test Setup

EQUIPMENT:

Signal Generator	HP 8640B Option 001
Digital Voltmeter	HP 3490A
Oscilloscope	HP 1740A
10:1 Probe	HP 10004D
1:1 Probe	HP 10007D
BNC Tee	HP Part No. 1250-0781

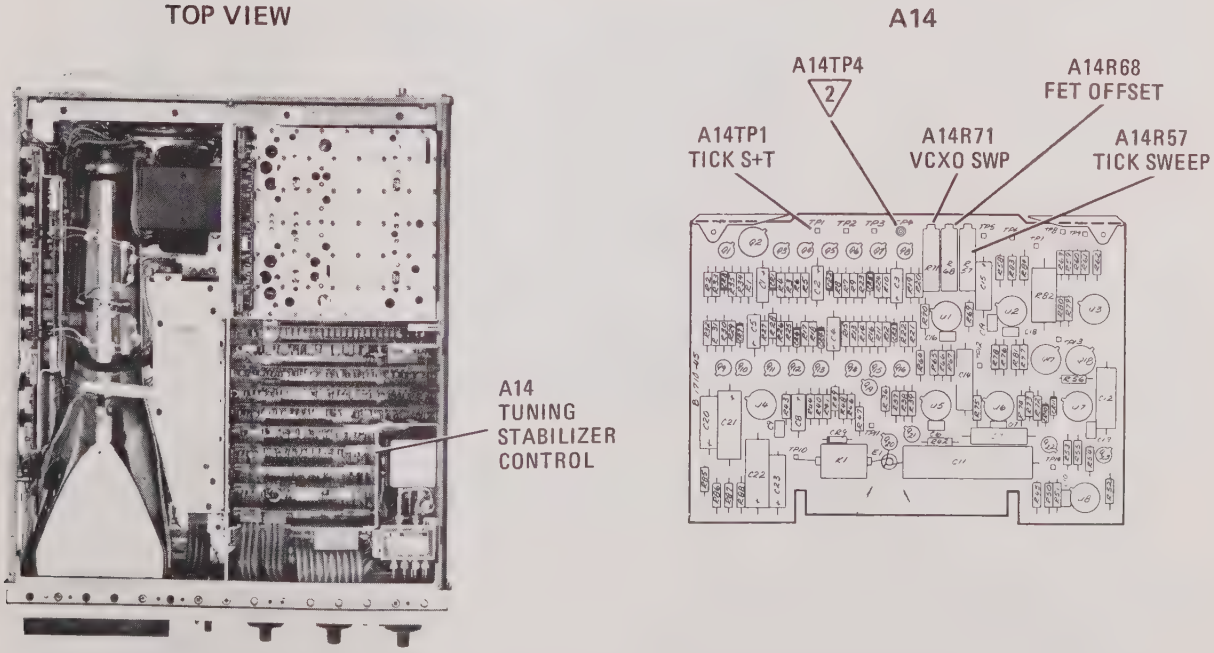


Figure 5-43. Tuning Stabilizer Control Adjustment Locations

ADJUSTMENTS

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top and bottom covers.

b. Reconnect power cord, set LINE switch ON, and connect equipment as shown in Figure 5-42.

Tuning Stabilizer Control Adjustments

c. Set controls as follows:

8565A:
Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 – 1.8
RESOLUTION BW (Coupled)	10 kHz
FREQ SPAN/DIV	100 kHz
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
FREQUENCY SPAN MODE	ZERO SPAN
AUTO STABILIZER	OFF

Signal Generator:

Output Level	−20 dBm
Frequency	50 MHz
Modulation Frequency	100 kHz
Modulation	FM
Peak Deviation	300 kHz
FM	OFF

d. Connect digital voltmeter across A14TP1 TICK S + T (high DVM input) and A14TP4 ⏚2 (low DVM input). (See Figure 5-43.)

e. Adjust FINE TUNING control for a digital voltmeter reading of 0 volts ±0.01 volts.

f. Connect digital voltmeter high input to A14TP3 VCXO SWP and adjust A14R68 FET OFF for 0.00 volts ±0.01 volts.

g. Set FREQUENCY SPAN MODE to PER DIV and connect signal generator output to spectrum analyzer INPUT 50Ω.

h. Center 50 MHz carrier frequency on spectrum analyzer CRT display, set 8640B FM switch to INT and adjust signal generator peak deviation for uniform amplitude of 100 kHz modulation peaks (Figure 5-44).

i. Adjust A14R57 TICK SWP for one division spacing between modulation peaks (use FINE TUNING control to align peaks on graticule line).

j. Set FINE TUNING control to midrange and activate tuning stabilizer (AUTO STABILIZER push-button out).

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

k. Adjust A14R71 VCXO SWP for one division spacing between modulation peaks (use FINE TUNING control to align peaks on graticule line).

NOTE

In the following step, adjust signal generator carrier frequency (50 MHz) to set modulation peaks on graticule lines.

l. Set FREQ SPAN/DIV control to 20 kHz (RESOLUTION BW 3 kHz) and note 5 division spacing between modulation peaks.

m. Check 5 division spacing between modulation peaks with FINE TUNING control set at fully counterclockwise, midrange, and fully clockwise positions. Adjust A14R71 VCXO SWP for best compromise of 5 division spacing over the full range of FINE TUNING control.

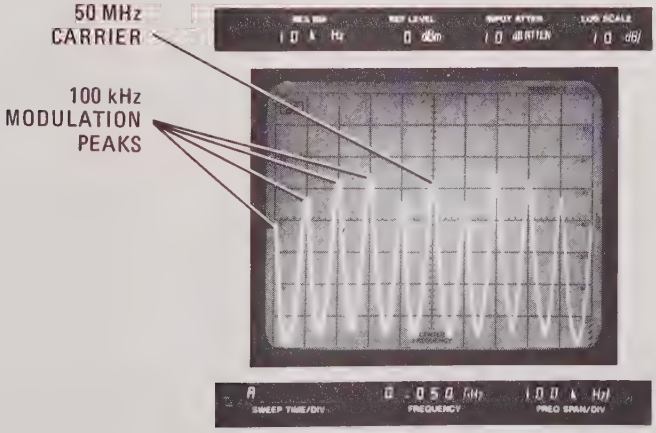


Figure 5-44. Spectrum Analyzer Display with 100 kHz FM

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

Tuning Stabilizer VCXO Linearity Check and Adjustment

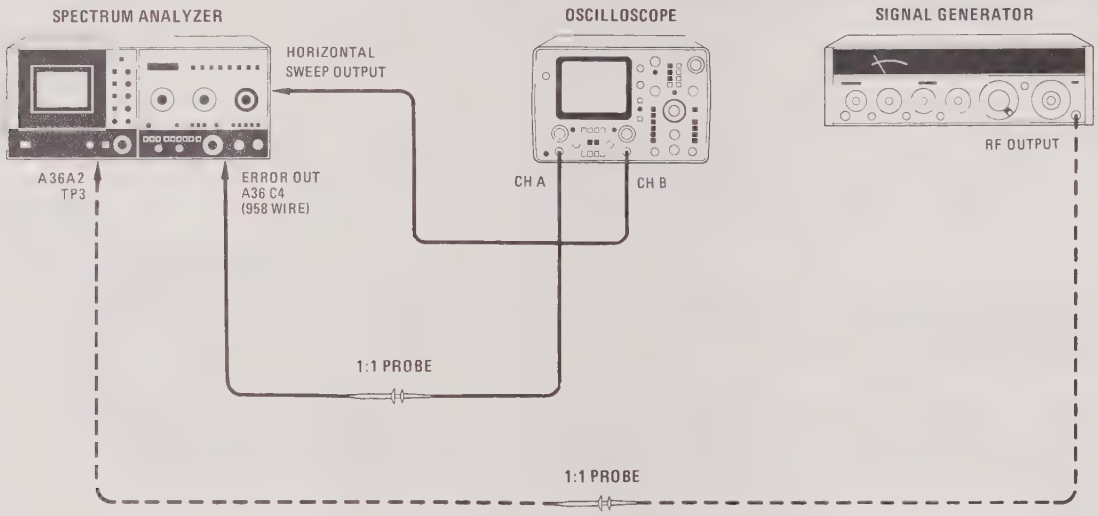


Figure 5-45. Tuning Stabilizer VCXO Check and Adjustment Test Setup

BOTTOM VIEW

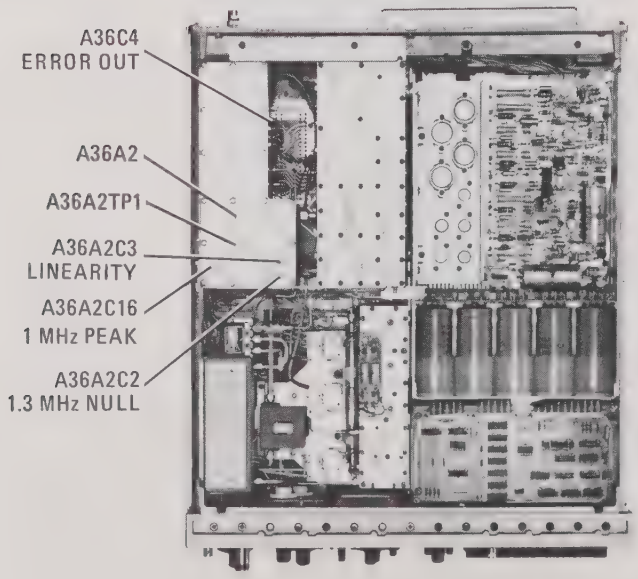


Figure 5-46. Tuning Stabilizer VCXO Adjustment Locations

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

n. Connect equipment as shown in Figure 5-45 and set oscilloscope for an externally swept (A / B) dc coupled display. Set CHAN A to 10 mV/DIV and CHAN B to 1V/DIV. Set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 – 1.8
FREQUENCY	0 MHz
RESOLUTION BW (coupled)	10 kHz
FREQ SPAN/DIV	100 kHz
FREQUENCY SPAN MODE	PER DIV
FINE TUNING control	midrange
AUTO STABILIZER	on (out)

o. Momentarily switch AUTO STABILIZER to OFF to remove dc component on ERROR OUT signal. Center oscilloscope trace with oscilloscope position controls.

p. Check slope of oscilloscope trace. The trace should not change more than one-half vertical division (5 mV) for every horizontal division swept.

q. Adjust FINE TUNING control over its three turn range while observing the oscilloscope trace. The trace should not change more than one-half vertical division (5 mV) for every horizontal divison swept.

NOTE

If slope of oscilloscope trace is within tolerance, no further adjustment is necessary. If adjustment is necessary, do not adjust A36A2R27 1 MHz GAIN. (This is for factory adjustment only).

r. If slope of oscilloscope trace is out of tolerance, set up oscilloscope for internal sweep and set 8565A FREQUENCY SPAN MODE to ZERO SPAN and AUTO STABILIZER pushbutton to OFF.

s. Remove A36A2 cover plate (Figure 5-46) for access to test points and center A36A2C3 LINEARITY.

t. Connect 1.3 MHz 3 volt peak-to-peak signal from signal generator through a 1:1 probe to A36A2TP3 (connect ground clip to chassis ground).

u. Connect oscilloscope through 10:1 probe to A36A2TP1 and adjust A36A2C2 1.3 MHz NULL for minimum 1.3 MHz signal. Disconnect signal generator from A36A2TP3.

v. Connect oscilloscope through 10:1 probe to A36A2TP2 and adjust A36A2C16 1 MHz PEAK for maximum 1 MHz signal.

w. Reinstall A36A2 cover plate and repeat steps n through q. If slope of oscilloscope trace is out of tolerance (steps p and q)make adjustments as follows:

5-28. TUNING STABILIZER CONTROL ADJUSTMENTS (Cont'd)

NOTE

Do each of the following adjustments in small steps and switch AUTO STABILIZER OFF then ON after each adjustment.

1. Adjust A36A2C3 LINEARITY and A36A2C16 1 MHz PEAK for minimum slope of oscilloscope trace.

2. Check slope of oscilloscope trace while adjusting FINE TUNING control over its three turn range. Oscilloscope trace should not change more than one-half vertical divison (5 mV) per horizontal division swept.

3. Repeat steps w-1 and w-2 until no further adjustment is necessary.

x. Check Tuning Stabilizer Control Adjustments (steps c through m). If VCXO SWP adjustment is performed, repeat steps n through q to check VCXO linearity.

y. Adjustment complete. Set LINE switch OFF disconnect power cord, and install 8565A top and bottom covers.

5-29. PRELIMINARY BIAS ADJUSTMENT

REFERENCE:

Service Sheet 19

DESCRIPTION:

NOTE

This is a preliminary adjustment and requires that the Frequency Response Adjustment (5-31) also be performed.

A synchronizer and sweep oscillator are connected to make a tracking generator for the 8565A. The sweep oscillator is phase locked on each FREQUENCY BAND checked, and mixer bias adjustments are performed for minimum amplitude variation consistent with near minimum conversion loss across the FREQUENCY BAND.

5-29. PRELIMINARY BIAS ADJUSTMENT (Cont'd)

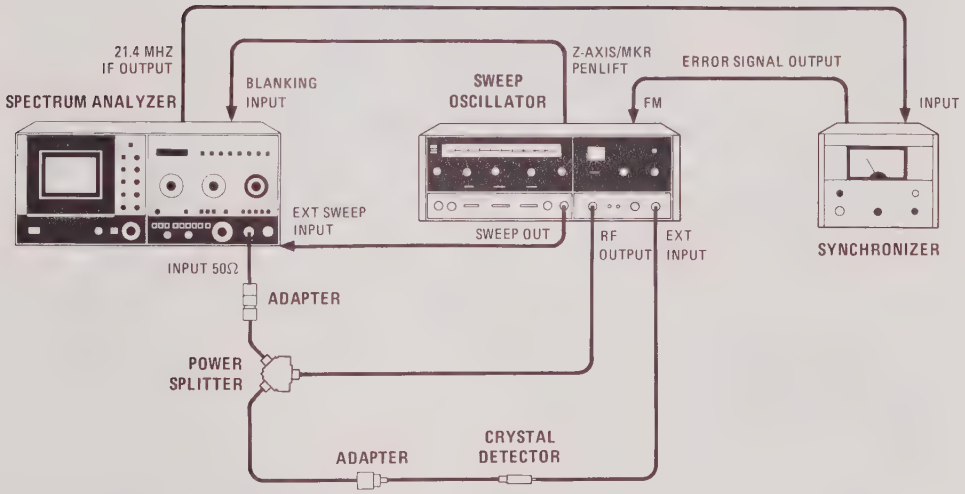


Figure 5-47. Preliminary Bias Adjustment Test Setup

EQUIPMENT:

Sweep oscillator	HP 8620C/86290A-H08
Synchronizer	HP 8709A-H10
Power Splitter	HP 11667A Option 002
Crystal Detector	HP 33330C
Adapter, APC-7 to Type N Male	HP 11525A
Adapter, APC-7 to SMA Female	HP 11534A

5-29. PRELIMINARY BIAS ADJUSTMENT (Cont'd)

PROCEDURE:

a. Set LINE switch OFF disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-47, and set controls as follows:

8565A:
Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	5.8 – 12.9
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	–4
FREQUENCY SPAN MODE	FULL BAND
AMPLITUDE SCALE	5 dB (LOG/DIV)
SWEEP SOURCE	EXT
PRESELECTOR PEAK	Centered in green

8620C/86290A-H08:

BAND	Band 4
MARKER SWEEP pushbutton	Depress
START MARKER pointer	5.8 GHz
STOP MARKER pointer	12.9 GHz
SWEEP TIME-SECONDS	.1 — .01
SWEEP TIME-SECONDS vernier	Fully counterclockwise
RF OFF-ON	ON
ALC switch	EXT
POWER LEVEL	Midrange
RF BLANKING/OFF	RF BLANKING
DISPLAY BLANKING/OFF	DISPLAY BLANKING
FM-NORM-PL	PL

c. Set A28S1 NORM-OFF-TEST switch to OFF. Set synchronizer ERROR SIGNAL switch to +.

d. Phase lock sweep oscillator as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control fully counterclockwise.

2. Set sweep oscillator start marker to low frequency of selected spectrum analyzer FREQUENCY BAND and adjust start marker for synchronizer phase lock (minimum phase error).

3. Set sweep oscillator manual sweep control fully clockwise and stop marker to high frequency of selected spectrum analyzer FREQUENCY BAND. Adjust stop marker for synchronizer phase lock (minimum phase error).

4. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display (Figure 5-48). If the system is breaking phase lock, repeat steps d-1 through d-3.

5-29. PRELIMINARY BIAS ADJUSTMENT (Cont'd)

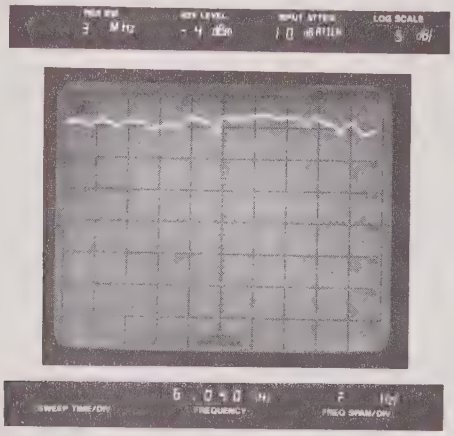


Figure 5-48. Phase Locked Spectrum Analyzer CRT Display

e. Adjust A20R3 V4 (Figure 5-49) over full range and note position for minimum ripple on CRT trace. Set A20R3 V4 for minimum ripple.

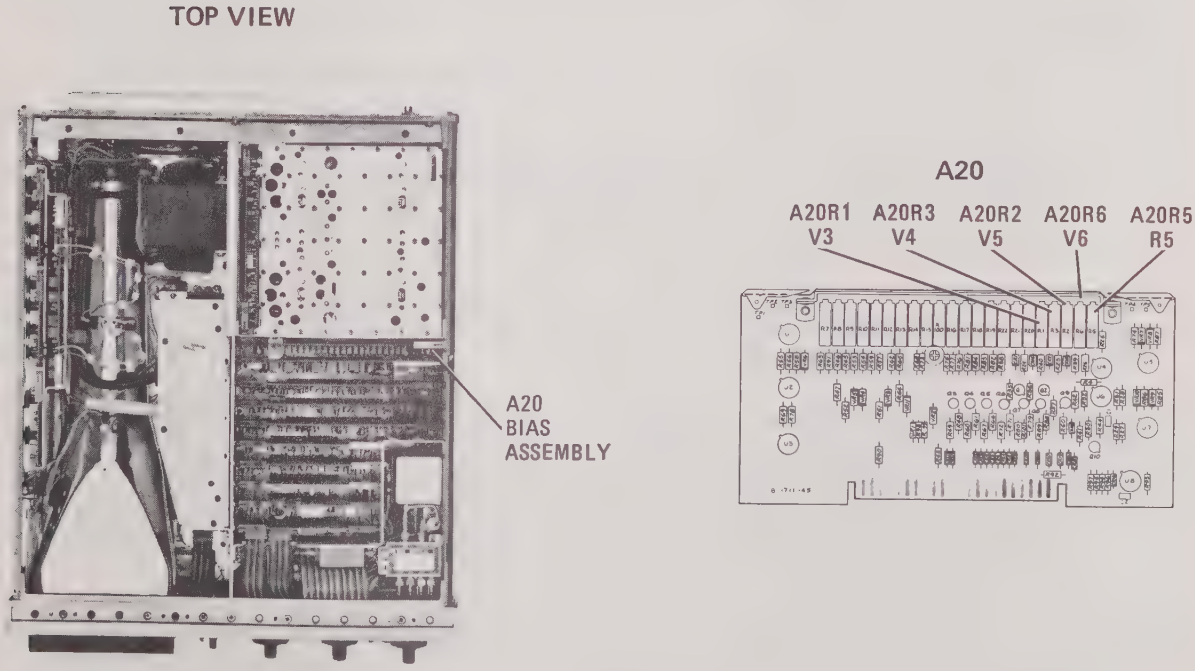


Figure 5-49. Preliminary Bias Adjustment Locations

5-29. PRELIMINARY BIAS ADJUSTMENT (Cont'd)

f. Set 8565A FREQUENCY BAND to 3.8 — 8.5 GHz. Set 8620C sweep oscillator for a MARKER SWEEP of 3.8 GHz to 8.5 GHz. Phase lock sweep oscillator according to step d.

g. Adjust A20R1 V3 over full range and note position for minimum ripple on CRT trace. Set A20R1 V3 for minimum ripple.

h. Set 8565A FREQUENCY BAND to 8.5 — 18 GHz. Set synchronizer ERROR SIGNAL switch to −. Set 8620C sweep oscillator for a MARKER SWEEP of 8.5 GHz to 18 GHz. Phase lock sweep oscillator according to step d.

i. Adjust A20R2 V5 over full range and note position for minimum ripple on CRT trace. Set A20R2 V5 for minimum ripple.

NOTE

If extended range sweep oscillator (8620C/86290A-H08) is not available, proceed to step l to perform preliminary bias adjustment for the 10.5 to 22 GHz FREQUENCY BAND.

j. Set 8565A FREQUENCY BAND to 10.5 — 22 GHz. Set 8620C/86290A-H08 sweep oscillator for a MARKER SWEEP of 10.5 GHz to 22 GHz. Phase lock sweep oscillator according to step d.

k. Adjust A20 R6 V6 over full range and note position for minimum ripple on CRT trace. Set A20R6 V6 for minimum ripple.

NOTE

Steps l and m are the procedure for performing the preliminary bias adjustment for the 10.5 to 22 GHz FREQUENCY BAND with a standard 8620C/86290A sweep oscillator. If steps j and k have been successfully completed, do not perform steps l and m.

l. Set 8565A FREQUENCY BAND to 10.5 — 22 GHz. Set 8620C sweep oscillator CW MARKER pointer to 16.4 GHz and ΔF pointer to 11.9 GHz (119 MHz X10). Press 8620C ΔF pushbutton, and phase lock sweep oscillator as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control set to midrange.

2. Adjust CW MARKER control for synchronizer phase lock (minimum phase error).

3. Set sweep oscillator manual sweep control fully counterclockwise. Adjust sweep oscillator ΔF control for synchronizer phase lock (minimum phase error).

4. Repeat steps n-1 through n-3 until no further adjustment is necessary.

5. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display (Figure 5-50). If system is breaking phase lock repeat steps l-1 through l-4.

5-29. PRELIMINARY BIAS ADJUSTMENT (Cont'd)

m. Adjust A20R6 V6 over full range and note position for minimum ripple on CRT trace. Set A20R6 V6 for minimum ripple.

n. Set A28S1 NORM-OFF-TEST switch to NORM. Perform Paragraph 5-31 Frequency Response Adjustment.

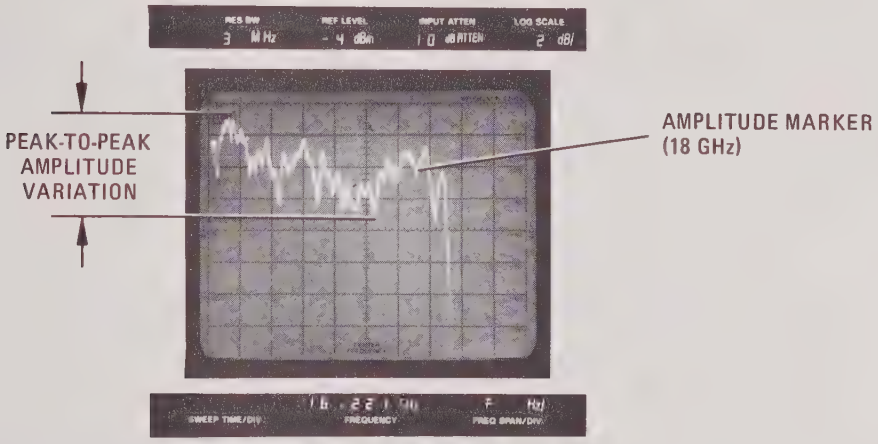


Figure 5-50. Phase Locked Spectrum Analyzer CRT Display (10.5–18 GHz)

5-30. YTF TRACKING ADJUSTMENT

REFERENCE:

Service Sheets 12 and 14

DESCRIPTION:

With a signal applied to INPUT 50Ω connector, the spectrum analyzer is set to ZERO SPAN (1st L.O. is CW frequency) and the YIG Tuned Filter (YTF) is swept around the center frequency. This results in the YTF passband being displayed on the CRT screen. YTF tracking adjustments are performed to keep the YTF passband approximately centered around the center frequency vertical graticule line over the full frequency range of the spectrum analyzer.

5-30. YTF TRACKING ADJUSTMENT (Cont'd)

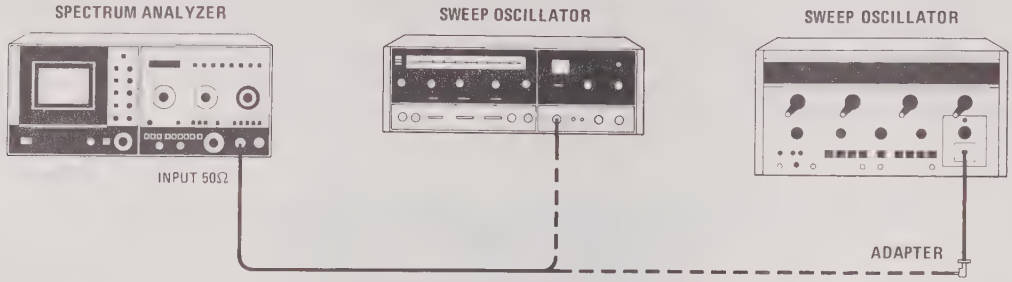


Figure 5-51. YTF Tracking Adjustment Test Setup

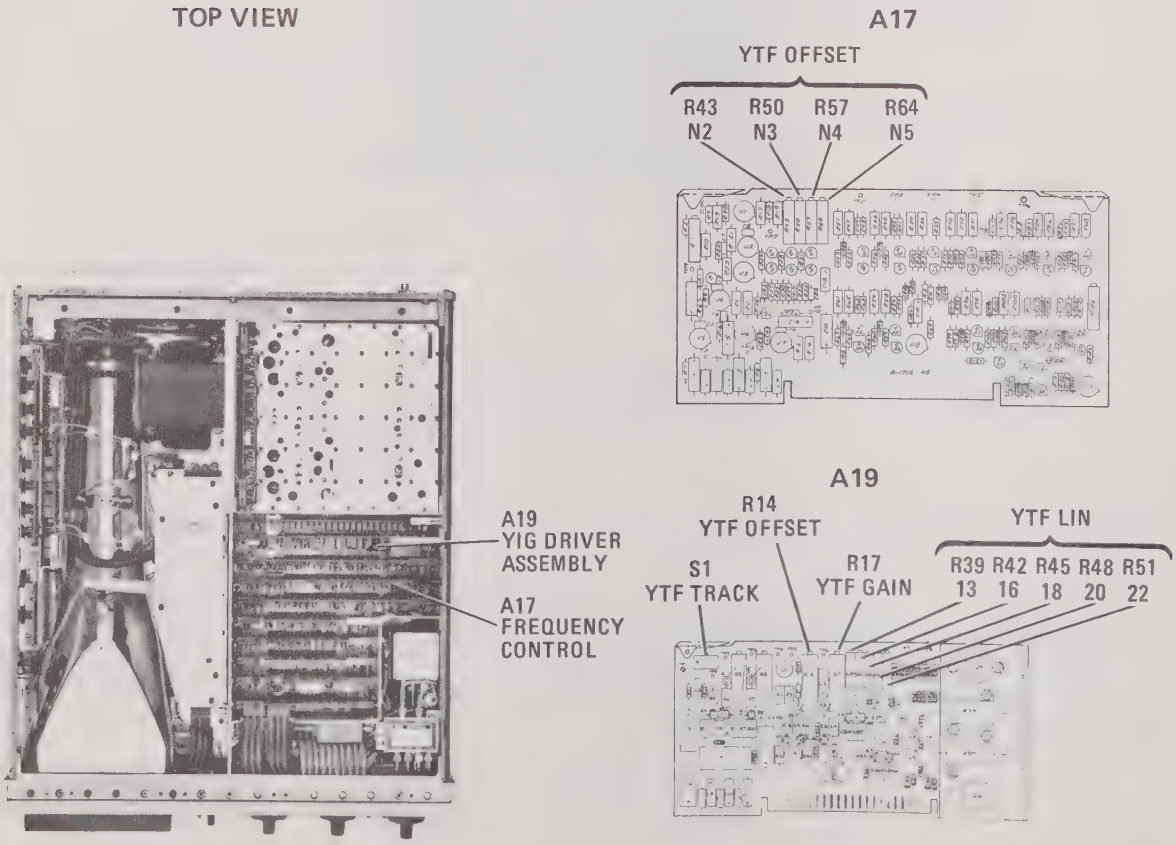


Figure 5-52. YTF Tracking Adjustment Locations

5-30. YTF TRACKING ADJUSTMENT (Cont'd)

EQUIPMENT:

NOTE

If an extended range sweep oscillator (8620C/86290A-H08) is available, the 8690B/8696A sweep oscillator is not required.

Sweep Oscillator (2 — 18 GHz)	HP 8620C/86290A
Sweep Oscillator (18 — 22 GHz)	HP 8690B/8696A
Adapter, Waveguide to SMA Jack	Narda 4608

PROCEDURE:

NOTE

Allow at least one hour instrument warm up before performing YTF Tracking Adjustment.

a. Set LINE switch OFF disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-51, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	1.7 – 4.1
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	3 MHz
FREQUENCY SPAN MODE	ZERO SPAN
SWEEP TIME/DIV	20 mSEC
AUTO STABILIZER	OFF
PRESELECTOR PEAK	Centered in green
TUNING	2.000 GHz

c. Set A19S1 YTF TRACK (Figure 5-52) switch to TEST position.

d. Simultaneously depress EXT and INT SWEEP SOURCE pushbuttons to obtain a dot on spectrum analyzer CRT display. Adjust front panel HORIZ POSN to position dot on center vertical graticule line. Set SWEEP SOURCE to INT. Select 1.7 — 22 GHz SPAN FREQUENCY SPAN MODE and allow spectrum analyzer to sweep several times before reselecting PER DIV FREQUENCY SPAN MODE.

5-30. YTF TRACKING ADJUSTMENT (Cont'd)

NOTE

Ensure that PRESELECTOR PEAK remains in center of green region throughout adjustment procedure.

NOTE

When repeating adjustments in group A, readjust YTF GAIN only at 10.5 GHz. If there is insufficient range on YTF LIN adjustments in groups B and C, the YTF GAIN can be compromised at 10.5 GHz to aid the YTF LIN adjustments. The YTF OFFSET affects offsets on all bands. YTF GAIN has an increasing affect with increasing frequency (for example: YTF GAIN has no affect at 2 GHz. But at 4 GHz, a 2 MHz shift in passband will result in a 6 MHz shift at 8 GHz, an 8 MHz shift at 10 GHz, and a 16 MHz shift at 18 GHz.

e. Tracking adjustments in Table 5-10 are listed in three groups (A, B, and C). Perform adjustments according to groups, and repeat adjustments in each group to give best compromise of centered passbands for that group before proceeding to the next group of adjustments. Perform each tracking adjustment listed in Table 5-10 as follows:

1. Select spectrum analyzer FREQUENCY BAND and adjust TUNING control for given FREQUENCY.

2. Remove error due to hysteresis by switching FREQUENCY SPAN MODE to FULL BAND, then back to ZERO SPAN.

3. Set sweep oscillator for a CW frequency equal to spectrum analyzer FREQUENCY. Adjust sweep oscillator CW frequency for maximum signal amplitude on spectrum analyzer CRT display.

4. Perform corresponding YTF tracking adjustment to center passband (10 dB points) on spectrum analyzer CRT display (Figure 5-53). Ensure that at least 25%of passband is on each side of center vertical graticule line.

f. Verify PRESELECTOR PEAK is centered in green region, and without making adjustments, recheck tracking by repeating step e.

g. Set A19S1 YTF TRACK switch to NORM. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

5-30. YTF TRACKING ADJUSTMENT (Cont'd)

Table 5-10. YTF Tracking Adjustment

Adjustment Group	Frequency Band	Frequency	Tracking Adjustment	Adjustment Effect
A	1.7 – 4.1 GHz	2.0 GHz	A19R14 YTF OFFSET	Overall Offset
	1.7 – 4.1 GHz	4.0 GHz	A19R17 YTF GAIN	Overall Gain
	3.8 – 8.5 GHz	4.0 GHz	A17R43 YTF OFFSET N2	Offset 3.8 – 8.5 BAND
	3.8 – 8.5 GHz	8.5 GHz	A19R17 YTF GAIN	Overall Gain
	5.8 – 12.9 GHz	8.5 GHz	A17R50 YTF OFFSET N3	Offset 5.8 – 12.9 BAND
	5.8 – 12.9 GHz	10.5 GHz	A19R17 YTF GAIN	Overall Gain
B	8.5 – 18 GHz	10.5 GHz	A17R57 YTF OFFSET N4	Offset 8.5 – 18 BAND
	8.5 – 18 GHz	13.0 GHz	A19R39 YTF LIN 13	Δ Gain above 10 GHz
	8.5 – 18 GHz	16.0 GHz	A19R42 YTF LIN 16	Δ Gain above 14 GHz
	8.5 – 18 GHz	18.0 GHz	A19R45 YTF LIN 18	Δ Gain above 16 GHz
C	10.5 – 22 GHz	10.5 GHz	A17R64 YTF OFFSET N5	Offset 10.5 – 22 GHz BAND
	10.5 – 22 GHz	20.0 GHz	A19R48 YTF LIN 20	Δ Gain above 18 GHz
	10.5 – 22 GHz	22.0 GHz	A19R51 YTF LIN 22	Δ Gain above 20 GHz

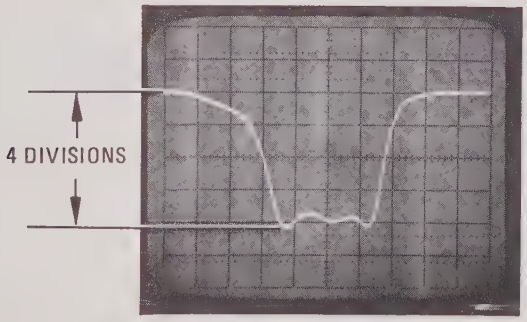


Figure 5-53. YTF Passband Display

ADJUSTMENTS

5-31. FREQUENCY RESPONSE ADJUSTMENT

REFERENCE:

Service Sheets 19 and 20

DESCRIPTION:

A synchronizer and sweep oscillator are connected to make a tracking generator for the 8565A. The YTF is modulated with a 1 kHz sine wave to eliminate amplitude variations due to small errors in YTF Tracking. The sweep oscillator is phase locked across each FREQUENCY BAND, and frequency response adjustments are performed.

CONFIGURATION A

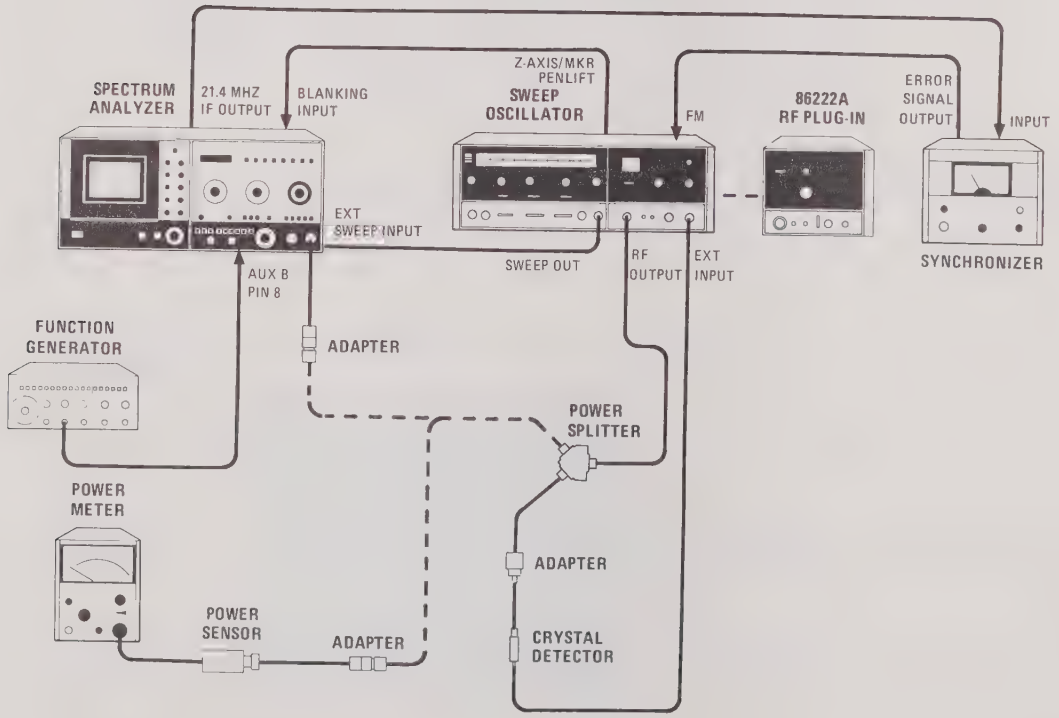


Figure 5-54. Frequency Response Adjustment Test Setup (Configuration A)

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

CONFIGURATION B

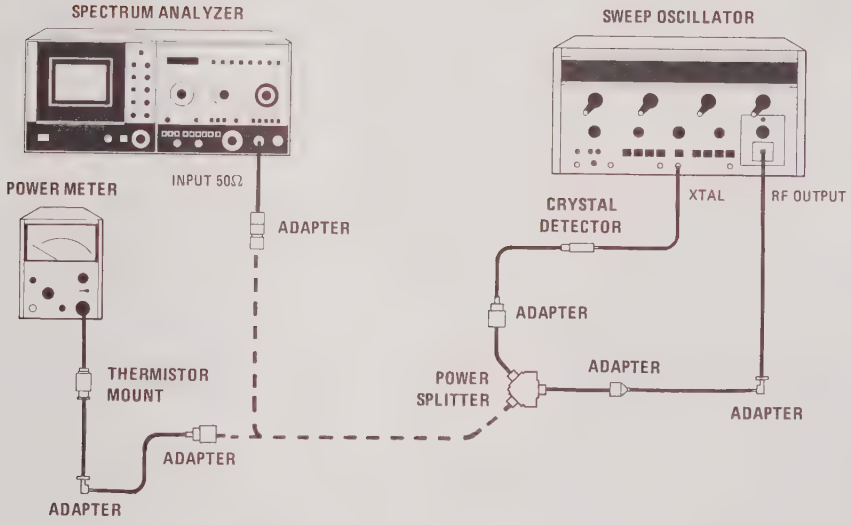


Figure 5-55. Frequency Response Adjustment Test Setup (Configuration B)

NOTE

If an extended range sweep oscillator (8620C/86290A-H08) is available, only the test equipment listed for CONFIGURATION A (Figure 5-54 is required. A standard 8620C/86290A sweep oscillator may be substituted, but then equipment listed for both CONFIGURATION A and B (Figure 5-55 is required.

CONFIGURATION A (Figure 5-54):

Sweep Oscillator	HP 8620C/86290A-H08
RF Plug-in	HP 86222A
Synchronizer	HP 8709-H10
Function Generator	HP 3312A
Power Meter	HP 435A
Power Splitter	HP 11667A Option 002
Power Sensor	HP 8481A
Crystal Detector	HP 33330C
Adapter, APC-7 to Type N Male	HP 11525A
Adapter, APC-7 to SMA Female	HP 11534A
Adapter, APC-7 to Type N Female	HP 11524A

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

CONFIGURATION B (Figure 5-55):

Sweep Oscillator	HP 8690B/8696A
Power Meter	HP 432A
Power Splitter (Same as CONFIGURATION A)	HP 11667A Option 002
Thermistor Mount	HP K486A
Crystal Detector (Same as CONFIGURATION A)	HP 33330C
Adapter	HP 11525A
Adapter	HP 11534A
Adapter	Narda 4608

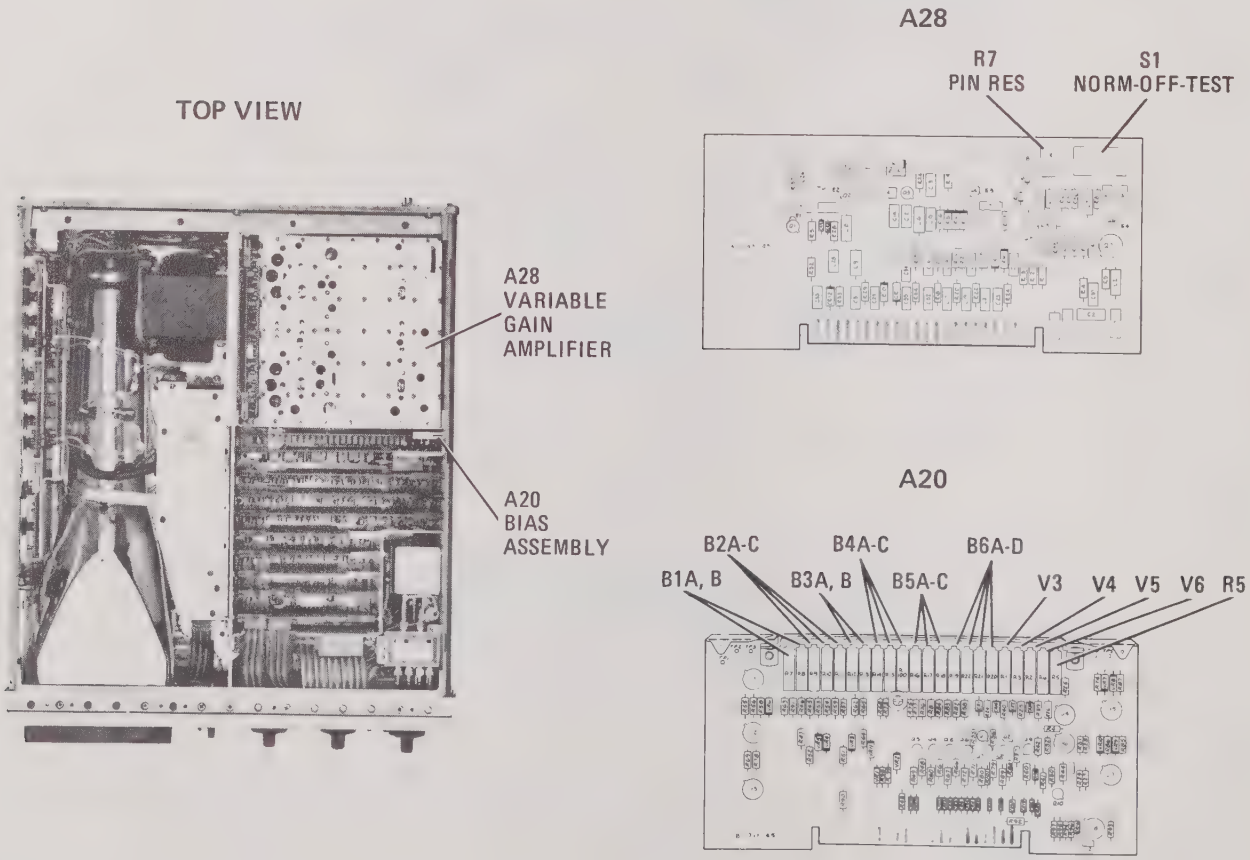


Figure 5-56. Frequency Response Adjustment Locations

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-54. CONFIGURATION A, and set controls as follows:

8565A:
Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	3.8 – 8.5
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
SWEEP SOURCE	EXT
FREQUENCY SPAN MODE	FULL BAND
AMPLITUDE SCALE	5 dB (LOG/DIV)
PRESELECTOR PEAK	Centered in green

Sweep Oscillator (8620C/86290A-H08):

BAND	Band 4
MARKER SWEEP pushbutton	Depress
START MARKER pointer	3.8 GHz
STOP MARKER pointer	8.5 GHz
SWEEP TIME-SECONDS	1 - .1
SWEEP TIME-SECONDS vernier	Fully clockwise
RF OFF-ON	ON
ALC switch	EXT
POWER LEVEL	Midrange
RF BLANKING/OFF (Rear Panel)	RF BLANKING
DISPLAY BLANKING/OFF (Rear Panel)	DISPLAY BLANKING
FM-NORM-PL (Rear Panel)	PL

c. Set A28S1 NORM-OFF-TEST switch (Figure 5-56) to OFF. Set synchronizer ERROR SIGNAL switch to +. Set function generator for a 1 kHz 1 to 2-volt peak-to-peak sine wave output.

d. Phase lock sweep oscillator as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control fully counterclockwise.

2. Set sweep oscillator start marker to low frequency of selected spectrum analyzer FREQUENCY BAND and adjust start marker for synchronizer phase lock (minimum phase error).

3. Set sweep oscillator manual sweep control fully clockwise and stop marker to high frequency of selected spectrum analyzer FREQUENCY BAND. Adjust stop marker for synchronizer phase lock (minimum phase error).

4. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display. If the system is breaking phase lock, repeat steps d-1 through d-3.

e. Note signal level on screen.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

f. Set A28S1 NORM-OFF-TEST switch to TEST and front panel INPUT ATTEN to 0 dB. Adjust A28R7 PIN RES for same signal level on CRT screen as that noted in step e.

g. Set PERSIST control fully counterclockwise and adjust INTENSITY control for normal intensity trace. Set AMPLITUDE SCALE to 2 dB.

NOTE

The "best line," as used in the following procedures, approximates the median line between the peaks and troughs of the upper edge of the 1 kHz modulation envelope. The best line is illustrated in Figure 5-57.

h. Note the best line as illustrated in Figure 5-57. Adjust REF LEVEL FINE control to set lowest point of that line on center horizontal graticule line. This point is used as a reference in checking for approximately same power level in FREQUENCY BANDS 5.8 — 12.9 GHz, 8.5 — 18 GHz and 10.5 — 22 GHz (steps i through u).

i. Set 8565A FREQUENCY BAND to 5.8 — 12.9 GHz. Set sweep oscillator for a MARKER SWEEP of 5.8 GHz to 12.9 GHz. Phase lock sweep oscillator according to step d.

j. Check that lowest point of best line (as defined above) is within ±2 dB of center horizontal graticule line. If not, change value of factory selected resistor A28R19* B4 GAIN. (Lower value increases signal level).

k. Set 8565A FREQUENCY BAND to 8.5 — 18 GHz and synchronizer ERROR SIGNAL switch to −. Set sweep oscillator for a MARKER SWEEP of 8.5 GHz to 18 GHz. Phase lock sweep oscillator according to step d.

l. Check that lowest point of best line is within ±2 dB of center horizontal graticule line. If not, change value of factory selected resistor A28R21* B5 GAIN (lower value increases signal level).

NOTE

If extended range sweep oscillator (8620C/86290A-H08) is not available, proceed to step o to check power level of the 10.5 — 22 GHz FREQUENCY BAND.

m. Set 8565A FREQUENCY BAND to 10.5 22 GHz. Set sweep oscillator for a MARKER SWEEP of 10.5 GHz to 22 GHz. Phase lock sweep oscillator according to step d.

n. Check that lowest point of best line is within ±2 dB of center horizontal graticule line. If not, change value of factory selected resistor A28R23* B6 GAIN (lower value increases signal level).

NOTE

Steps o through u are the procedure for checking power level of the 10.5 — 22 GHz FREQUENCY BAND with a standard 8620C/86290A sweep oscillator. If steps m and n have been successfully completed, do not perform steps o through u.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

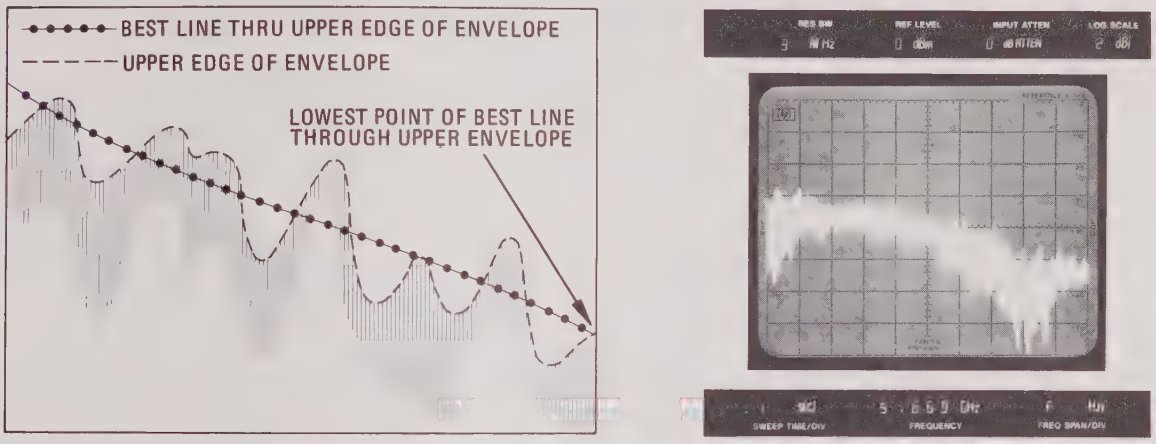


Figure 5-57. Best Line Relative to 1 kHz Modulation Envelope

o. Set 8565A FREQUENCY BAND to 10.5 — 22 GHz. Set 8620C sweep oscillator CW MARKER pointer to 16.4 GHz and ΔF POINTER to 11.9 GHz. Phase lock sweep oscillator as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control set to midrange.
2. Adjust CW MARKER control for synchronizer phase lock (minimum phase error).
3. Set sweep oscillator manual sweep control fully counterclockwise. Adjust ΔF control for synchronizer phase lock (minimum phase error).
4. Repeat steps o-1 through o-3 until no further adjustment is necessary.
5. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display. If the system is breaking phase lock repeat steps o-1 through o-4.

p. Check that lowest point of best line is within ±2 dB of center horizontal graticule line. If not, change value of factory selected resistor A28R23* B6 GAIN (lower value increases signal level).

q. Set sweep oscillator amplitude marker to 18 GHz and note level of spectrum analyzer trace coincident with marker. Disconnect 8620C sweep oscillator output from 8565A INPUT 50Ω.

r. Connect 8690B/8696A as shown in Figure 5-55 CONFIGURATION B and set sweep oscillator for a CW frequency of 18 GHz.

s. Set 8565A SWEEP SOURCE to INT and adjust 8690B/8696A sweep oscillator power level for same 18 GHz signal level noted in step q.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

t. Characterize sweep oscillator output as follows:

1. Disconnect power splitter from spectrum analyzer INPUT 50Ω and connect power meter to power splitter output.

2. Note power level at 18 GHz, then slowly tune sweep oscillator from 18 GHz to 22 GHz and note all peak deviations and frequencies at which they occur, from power level at 18 GHz. Record frequencies and deviations in Table 5-11 (see example).

3. Reconnect power splitter output to 8565A INPUT 50Ω and set 8690B/8696A sweep oscillator for a manually triggered start/stop sweep of 18 GHz to 22 GHz with a sweep time of 100 seconds.

4. Set 8565A PERIST control fully clockwise and press ERASE pushbutton.

5. Trigger sweep oscillator start/stop sweep and adjust sweep time vernier for display similar to that of Figure 5-58. STORE display on spectrum analyzer CRT.

6. Record deviations from signal level at 18 GHz in Table 5-11.

7. Algebraically subtract Peak Deviation from CRT Actual Deviation for each frequency in Table 5-11. Record corrected deviation in Table 5-11.

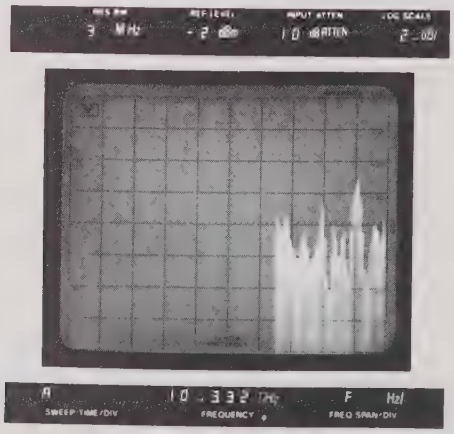


Figure 5-58. Typical Frequency Response (8690B/8696A)

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

Table 5-11. Error Characterization of Signal Source

Frequency (GHz)	Peak Deviation (dB)	CRT Horizontal Displacement (div)	Actual Deviation (dB)	Corrected Deviation (dB)

Example:

Frequency (GHz)	Peak Deviation (dB)	CRT Horizontal Displacement (div)	Actual Deviation (dB)	Corrected Deviation (dB)
18.6	−1.0	7	−1.0	0
19.6	−0.5	7.8	−1.0	−0.5
20.1	+1.0	8.3	0	−1.0
20.6	−1.5	8.7	−2.0	−0.5
21.2	+0.5	9.2	+1.5	+1.0
21.8	−1.0	9.7	−0.4	+0.6

u. Algebraically add the maximum negative corrected deviation and power level recorded at 18 GHz (step t-2). This corrected power level should be within ±2 dB of reference set in step h. If not, change value of factory selected resistor A28R23* B6 GAIN (lower value increases signal level).

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

v. Connect equipment as shown in Figure 5-54 CONFIGURATION A. Set A28S1 NORM-OFF-TEST switch to NORM. Set 8565A FREQUENCY BAND to 3.8 — 8.5 GHz, INPUT ATTEN to 10 dB, REF LEVEL to 0 dBm and REF LEVEL FINE to 0. Set synchronizer ERROR SIGNAL switch to +. Set sweep oscillator for a MARKER SWEEP of 3.8 GHz to 8.5 GHz.

w. Phase lock sweep oscillator and set output power level as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control fully counterclockwise.

2. Set sweep oscillator start marker to low frequency of selected spectrum analyzer FREQUENCY BAND and adjust start marker for synchronizer phase lock (minimum phase error).

3. Set sweep oscillator manual sweep control fully clockwise and stop marker to high frequency of selected spectrum analyzer FREQUENCY BAND. Adjust stop marker for synchronizer phase lock (minimum phase error).

4. Disconnect power splitter from 8565A INPUT 50Ω and connect power meter to power splitter output.

5. Slowly adjust sweep oscillator manual sweep control over its entire range, and adjust power level for an average power meter reading of −8 dBm.

6. Disconnect power meter and reconnect power splitter output to 8565A INPUT 50Ω.

7. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display. If the system is breaking phase lock, repeat steps w-1 through w-3.

x. Obtain on-screen display using REF LEVEL CAL. Adjust A20R13 B3B for minimum slope of trace. Adjust A20R12 B3A CCW so that the right side of trace drops 2 dB. Readjust A20R13 B3B for minimum slope (see Figure 5-59). Using REF LEVEL CAL and REFERENCE LEVEL FINE, set the best line. Do not readjust REF LEVEL CAL or REFERENCE LEVEL FINE in steps z through as.

y. Adjust A20R1 V3 for minimum amplitude variations of upper edge of envelope on CRT trace. Repeat step x.

z. Set 8565A FREQUENCY BAND to 5.8 — 12.9 GHz. Set sweep oscillator for a MARKER SWEEP of 5.8 GHz to 12.9 GHz. Phase lock sweep oscillator and set output power level according to step w.

aa. Adjust A20R14 B4A, A20R15 B4B, and A20R100 B4C to set best line at the center horizontal graticule line, with minimum slope.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

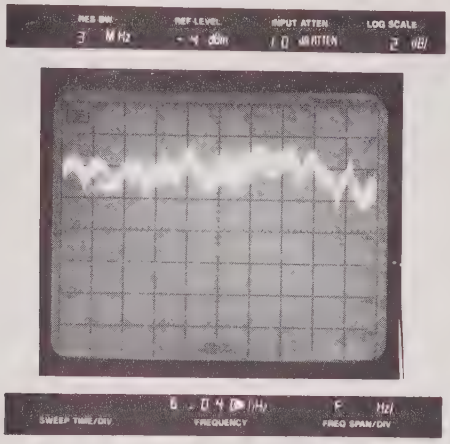


Figure 5-59. Frequency Response Adjustment CRT Display

ab. Adjust A20R3 V4 for minimum amplitude variations of the upper edge of the envelope on CRT trace. If amplitude variations on high frequency portion of the band are excessive ($> \pm 2.5$ dB) change value of factory selected resistor A20R29* and readjust A20R3 V4. Repeat step aa.

ac. Set 8565A FREQUENCY BAND to 8.5 — 18 GHz. Set synchronizer ERROR SIGNAL switch to −. Set sweep oscillator for a MARKER SWEEP of 8.5 GHz to 18 GHz. Phase lock sweep oscillator and set output power level according to step w.

ad. Adjust A20R16 B5A, A20R17 B5B, and A20R18 B5C to set best line at center horizontal graticule line.

ae. Set A20R5 fully counterclockwise and adjust A20R2 V5 for minimum amplitude variations of upper edge of envelope on CRT trace. Set A20R5 to several positions over its range and readjust A20R2 V5 for minimum amplitude variations at each setting. Set A20R5 to position giving minimum amplitude variations and adjust A20R2 V5 for minimum variations. Repeat step ad.

af. Set 8565A FREQUENCY BAND to 10.5 — 22 GHz. Set sweep oscillator for a MARKER SWEEP of 10.5 GHz to 22 GHz. Phaselock sweep oscillator and set output power level according to step w.

ag. Adjust A20R19 B6A, A20R22 B6B, A20R21 B6C, and A20R20 B6D to set best line at the center horizontal graticule line, with minimum slope.

ah. Adjust A20R6 V6 for minimum amplitude variations on CRT trace. Repeat step ag.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

NOTE

Steps ai through am are the flatness adjustment procedures for the 10.5 — 22 GHz FREQUENCY BAND using standard sweep oscillators (8620C/86290A and 8690B/8696A). If steps af through ah have been successfully completed, do not perform steps ai through am.

ai. Set 8565A FREQUENCY BAND to 10.5 — 22 GHz. Set 8620C sweep oscillator CW MARKER pointer to 16.4 GHz and ΔF pointer to 11.9 GHz. Phase lock sweep oscillator and set output power level as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control set to midrange.
2. Adjust CW MARKER control for synchronizer phase lock (minimum phase error).
3. Set sweep oscillator manual sweep control fully counterclockwise. Adjust ΔF control for synchronizer phase lock (minimum phase error).
4. Repeat steps ai-1 through ai-3 until no further adjustment is necessary.
5. Disconnect power splitter from 8565A INPUT 50Ω connector and connect power meter to power splitter output.
6. Set 8565A AMPLITUDE SCALE to 10 dB and note that CRT trace can be manually swept with sweep oscillator manual sweep control. Manually sweep spectrum analyzer CRT trace from left graticule edge (10.5 GHz) to six and one-half divisions (18 GHz) and adjust sweep oscillator power level for an average power meter reading of −8 dBm over this range.
7. Disconnect power meter and reconnect power splitter output to 8565A INPUT 50Ω. Set 8565A AMPLITUDE SCALE to 2 dB.
8. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display. If system is breaking phase lock, repeat steps ai-1 through ai-4.

aj. Adjust A20R19 B6A, A20R22 B6B, and A20R21 B6C to set best line at the center horizontal graticule line, with minimum slope. Do this for the first 6.5 divisions of sweep.

ak. Adjust A20R6 V6 for minimum amplitude variations of upper edge of envelope for first 6.5 divisions of CRT trace. Repeat step aj.

al. Perform steps q through t.

am. Use corrected deviation data (step t-7) to determine approximate slope of corrected CRT trace. Adjust A20R20 B6D to set the best line at the center horizontal graticule line with minimum slope.

5-31. FREQUENCY RESPONSE ADJUSTMENT (Cont'd)

an. Connect equipment as shown in Figure 5-54 CONFIGURATION A. Select 8565A FREQUENCY BAND of 1.7 — 4.1 GHz and set SWEEP SOURCE to EXT. Set synchronizer ERROR SIGNAL switch to +. Set 8620C sweep oscillator CW MARKER pointer to 2.9 GHz and ΔF pointer to 2.4 GHz. Depress 8620C ΔF pushbutton. Phase lock sweep oscillator and set output power level as follows:

1. Set sweep oscillator to manual sweep mode with manual sweep control fully clockwise.
2. Adjust sweep oscillator ΔF control for synchronizer phase lock (minimum phase error).
3. Set sweep oscillator manual sweep control to midrange. Adjust CW MARKER control for synchronizer phase lock (minimum phase error).
4. Repeat steps an-1 through an-3 until no further adjustment is necessary.
5. Disconnect power splitter from 8565A INPUT 50Ω and connect power meter to power splitter output.
6. Slowly adjust sweep oscillator manual sweep control over its entire range, and adjust power level for an average power meter reading of −8 dBm.
7. Disconnect power meter and reconnect power splitter output to 8565A INPUT 50Ω.
8. Set sweep oscillator to automatic sweep mode and check for phase locked spectrum analyzer CRT display. If system is breaking phase lock, repeat steps an-1 through an-4.

ao. Adjust A20R9 B2A, A20R10 B2B, and A20R11 B2C to set best line at the center horizontal graticule line, with minimum slope.

ap. Set sweep oscillator LINE switch OFF and replace 86290A RF Plug-in test setup (Figure 5-54 CONFIGURATION A) with 86222 RF Plug-in. Set sweep oscillator LINE switch ON, POWER LEVEL to midrange, ALC switch to EXT, and rear panel FM-NORM-PL switch to PL.

aq. Set 8565A FREQUENCY BAND to .01 — 1.8 GHz. Set sweep oscillator for a MARKER SWEEP of .01 GHz to 1.8 GHz. Phase lock sweep oscillator and set output power level according to step w.

ar. Adjust A20R7 B1A and A20R8 B1B to set best line at the center horizontal graticule line, with minimum slope.

as. Adjustment complete. Proceed to 5-32 Absolute Amplitude Calibration.

ADJUSTMENTS

5-32. ABSOLUTE AMPLITUDE CALIBRATION

REFERENCE:

Service Sheet 20

DESCRIPTION:

The 100 MHz CAL OUTPUT signal is displayed on the spectrum analyzer CRT screen. Factory selected resistor A28R2 is selected so that REF LEVEL CAL functions over the range that optimizes noise and distortion performance.

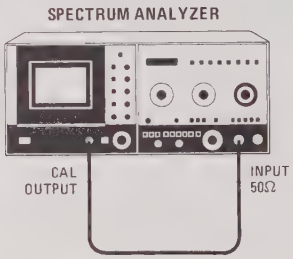


Figure 5-60. Absolute Amplitude Calibration Test Setup

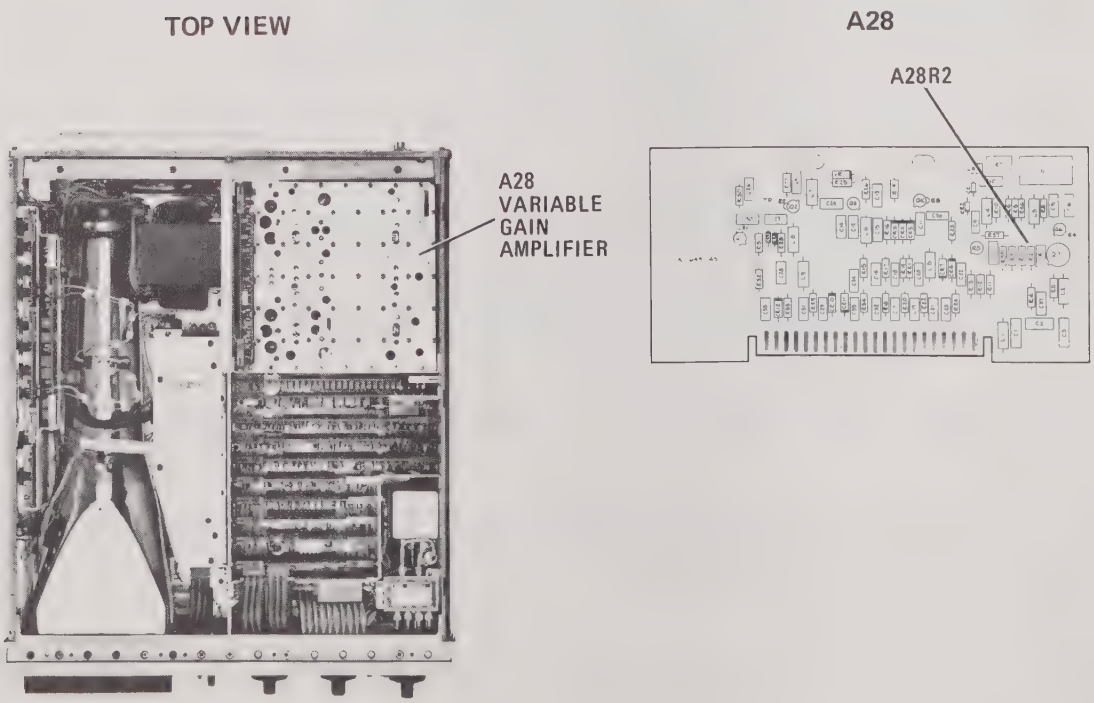


Figure 5-61. Absolute Amplitude Calibration Adjustment Locations

5-32. ABSOLUTE AMPLITUDE CALIBRATION (Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, and remove 8565A top cover.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-60, and set 8565A controls as follows:

Set all Normal Settings (controls marked with green)

FREQUENCY BAND GHz	.01 – 1.8
INPUT ATTEN	10 dB
REF LEVEL	0 dBm
REF LEVEL FINE	0
RESOLUTION BW	1 MHz
FREQUENCY SPAN/DIV	10 MHz
AMPLITUDE SCALE	2 dB
TUNING	0.100 GHz
REF LEVEL CAL	Fully counterclockwise

c. Adjust TUNING control to center 100 MHz signal on CRT display.

d. Adjust REF LEVEL CAL clockwise to increase 100 MHz signal amplitude by 3 dB (1 1/2 divisions).

e. Note how many dB signal peak is away from third graticule line from the bottom of display.

f. For every dB signal peak is away from this graticule line, change value of factory selected resistor A28R2 (Figure 5-61) by 10%. (An increase in resistance will increase signal level.) When signal is within 1 dB of graticule line, proceed to step g.

g. Adjust REF LEVEL CAL to position signal peak on third graticule line from bottom of display.

h. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

ADJUSTMENTS

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS

REFERENCE:

Service Sheets 37, 38, and 39

DESCRIPTION:

The first-stage center frequency of the 3 MHz Filter is aligned with the center frequency of the 3 kHz bandwidth. The bandpass of each stage of the 3 MHz Filter is adjusted for centering and symmetry while the spectrum analyzer is in the 1 kHz bandwidth. The LO NULL capacitor in the Up Down Converter is adjusted for minimum 18.4 MHz LO signal to the Step Gain Amplifier. (This signal is monitored in the Bandwidth Filter No. 2 Assembly.) DC GAIN in the Up Down Converter is adjusted to set the amplitude of the 1 kHz bandwidth relative to the amplitude of the 1 MHz bandwidth. The .3 kHz and .1 kHz bandwidth amplitudes are then adjusted to the 1 kHz bandwidth amplitude. The 1 kHz, .3 kHz, and .1 kHz bandwidths 3-dB points are measured to ensure that they are within tolerance.

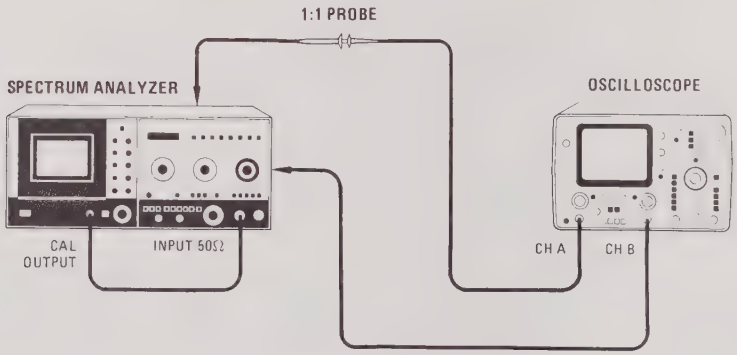


Figure 5-62. Option 100 Bandwidth Filter Adjustments Test Setup

EQUIPMENT:

Oscilloscope	HP 1740A
1:1 Divider Probe	HP 10007D

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

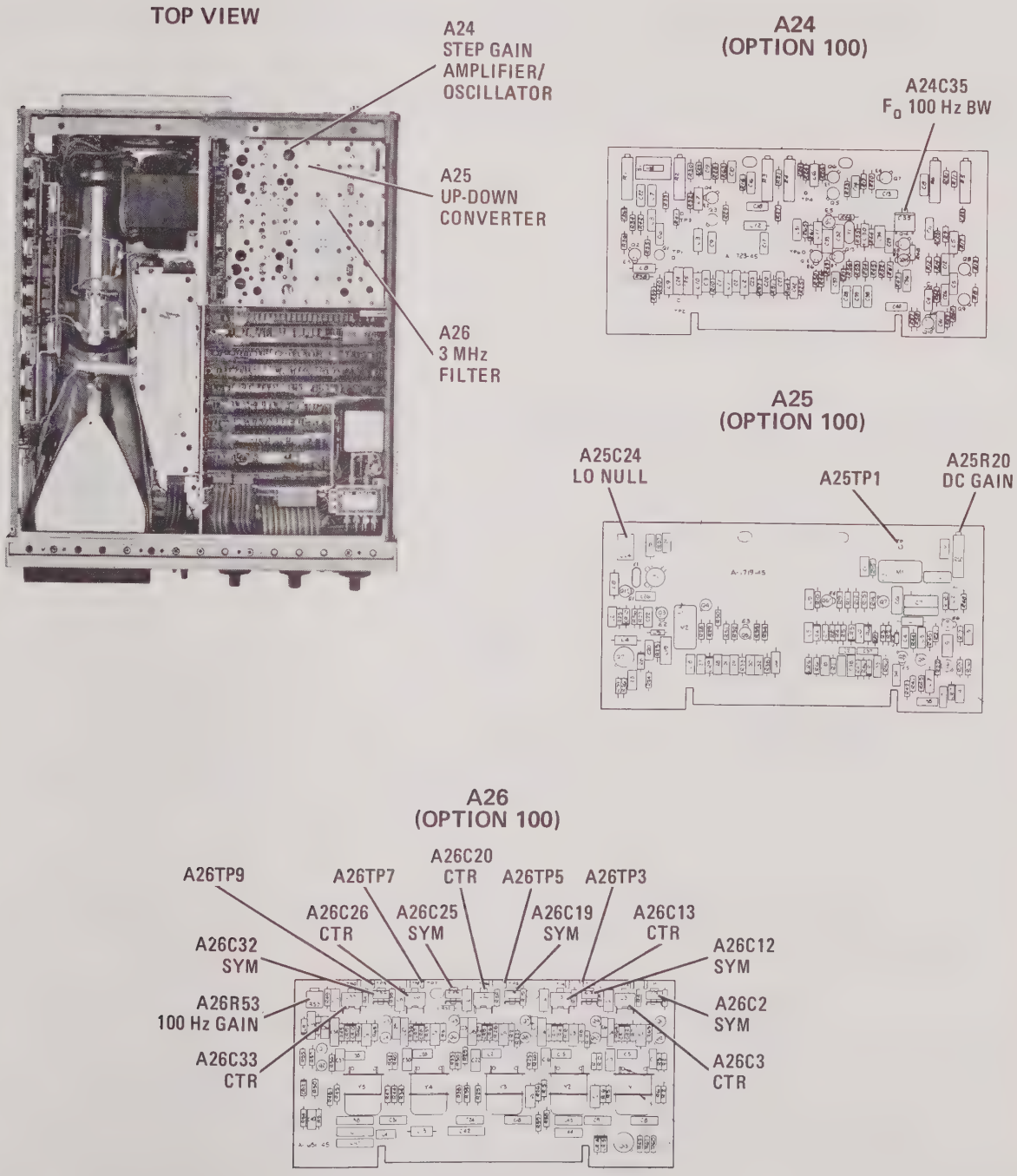


Figure 5-63. Option 100 Bandwidth Filter Adjustment Locations

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

PROCEDURE:

a. Set LINE switch OFF, disconnect power cord, remove 8565A top cover, and install A25 Up-Down Converter on an extender board.

b. Reconnect power cord, set LINE switch ON, connect equipment as shown in Figure 5-62, and set 8565A controls as follows:

FREQUENCY BAND GHz	.01 — 1.8
INPUT ATTEN	0 dB
REF LEVEL	−10 dBm
REF LEVEL FINE	0
RESOLUTION BW	1 kHz
FREQUENCY SPAN/DIV	1 kHz
FREQUENCY SPAN MODE	LIN
TUNING	100 MHz

c. Connect oscilloscope probe to A25 pin 31 and check 18.4 MHz LO signal is approximately 22 millivolts peak-to-peak (−10 dBm). If LO signal is less than 22 millivolts peak-to-peak, decrease value of factory selected resistor A24R55* (minimum value 383 ohms).

d. Set RESOLUTION BW to 3 kHz and adjust front panel TUNING and FINE TUNING controls to center 100 MHz signal on spectrum analyzer CRT display.

e. Connect oscilloscope probe to A26TP3 (Figure 5-63) and set RESOLUTION BW switch to 1 kHz.

NOTE

A non-metallic tuning tool is required for all crystal filter and LO adjustments.

f. Adjust A26C3 CTR for minimum signal amplitude on oscilloscope display.

g. Adjust A24C35 F_O 100 Hz Bw to center signal on oscilloscope display.

h. Repeat steps d through g until no further adjustment is necessary.

i. Adjust A26C2 SYM and A26C3 CTR for a centered and symmetrical bandpass on oscilloscope display.

j. Connect oscilloscope probe to A26TP5 and adjust A26C12 SYM and A26C13 CTR for a centered and symmetrical bandpass on oscilloscope display.

k. Connect oscilloscope probe to A26TP7 and adjust A26C19 SYM and A26C20 CTR for a centered and symmetrical bandpass on oscilloscope display.

l. Connect oscilloscope probe to A26TP9 and adjust A26C25 SYM and A26C26 CTR for a centered and symmetrical bandpass on oscilloscope display.

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

m. Disconnect oscilloscope probe and adjust A26C32 SYM and A26C33 CTR for a centered and symmetrical bandpass on spectrum analyzer CRT display.

n. Check that RESOLUTION BW is set to 1 kHz. Disconnect 100 MHz CAL OUTPUT signal from INPUT 50Ω connector. Set INPUT ATTEN to 0 dB, REF LEVEL to −50 dBm, REF LEVEL FINE to −12, and FREQUENCY SPAN MODE to ZERO SPAN.

o. Connect oscilloscope probe to A23TP1 in the Bandwidth Filter No. 2 Assembly and adjust A25C24 LO NULL for minimum signal amplitude.

p. Connect 100 MHz CAL OUTPUT signal to INPUT 50Ω connector. Set REF LEVEL to 0 dBm, RESOLUTION BW to 1 MHz, and FREQUENCY SPAN MODE to PER DIV.

q. Adjust REF LEVEL FINE control to set 100 MHz signal peak on REFERENCE LEVEL graticule line.

r. Set RESOLUTION BW to 1 kHz (center signal on CRT) and adjust A25R20 DC GAIN to set 100 MHz signal peak on REFERENCE LEVEL graticule line. If adjustment does not have enough range, change value of factory selected resistor A25R23*. An increase in resistance increases signal amplitude.

s. Set RESOLUTION BW to .1 kHz and adjust A26R53 100 Hz GAIN to set 100 MHz signal peak on REFERENCE LEVEL graticule line.

t. Set RESOLUTION BW to .3 kHz and check 100 MHz signal peak is within ±0.5 dB of REFERENCE LEVEL graticule line. If not, change value of factory selected resistor A26R54*. An increase in resistance increases signal amplitude.

u. Set RESOLUTION BW to 1 kHz, FREQUENCY SPAN/DIV to 1 kHz, and AMPLITUDE SCALE to LIN. Connect frequency counter to rear panel 21.4 MHz IF OUTPUT connector.

v. Adjust REF LEVEL FINE control to set 100 MHz signal peak 7.1 divisions above graticule line.

NOTE

When signal peak is set to 7.1 divisions, the 3 dB bandwidth points are located five divisions above the baseline graticule.

w. Measure 3 dB bandwidth for each RESOLUTION BW listed in Table 5-12 as follows:

1. Set SWEEP SOURCE to MAN.

2. Adjust MANUAL SWEEP control to position trace on lower frequency 3 dB point. Note frequency counter indiction.

Frequency_____ MHz

5-33. OPTION 100 BANDWIDTH FILTER ADJUSTMENTS (Cont'd)

3. Adjust MANUAL SWEEP control to position trace on upper frequency 3 dB point. Note frequency counter indication.

Frequency_____MHz

4. Subtract frequency noted in step 2 from frequency noted in step 3. This frequency difference is the 3 dB bandwidth; check that it is within the 3 dB bandwidth limits listed in Table 5-12.

5. If the 1 kHz RESOLUTION BW is out of tolerance, change the values of factory-selected resistors listed in Table 5-12. These resistors must be changed in pairs (shown by parentheses), and the parallel resistance of any pair should not vary more than 10 percent from the parallel resistance of any other pair.

6. If the .3 kHz or .1 kHz RESOLUTION BW is out of tolerance, change the values of the factory-selected resistors listed in Table 5-12. Each resistor in a set must have a value within 10 percent of the other resistors.

x. Adjustment complete. Set LINE switch OFF, disconnect power cord, and install 8565A top cover.

Table 5-12. Factory-Selected Resistors

Resolution BW	Factory-Selected Resistors	3 dB BW Limits
1 kHz	(A26R9, A26R10), (A26R19, A26R20), (A26R29, A26R30), (A26R39, A26R40), (A26R49, A26R48)	0.8 to 1.2 kHz
.3 kHz	A26R7, A26R18, A26R28, A26R37, A26R46	255 to 345 Hz
.1 kHz	A26R17, A26R27, A26R36, A26R45, A26R64	85 to 115 Hz

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-1 lists abbreviations used in the parts list and throughout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains names and addresses that correspond to the manufacturer's code numbers.

6-3. ABBREVIATIONS

6-4. Table 6-1 lists abbreviations used in the parts list, schematics and throughout the manual. In some cases, two forms of the abbreviation are given, one uses all capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

6-5. REPLACEABLE PARTS LIST

6-6. Table 6-2 is the list of replaceable parts and is organized as follows:

a. Electrical assemblies and their components in alpha-numerical order by reference designation.

b. Chassis-mounted parts in alpha-numeric order by reference designation.

c. Miscellaneous parts.

d. Illustrated parts breakdown.

The information given for each part consists of the following:

a. The Hewlett-Packard part number

b. The total quantity (Qty) in the instrument.

c. The description of the part.

d. The typical manufacturer of the part in a five-digit code.

e. Manufacturer code number for the part.

The total quantity for each part is given only once — at the first appearance of the part number in the list.

6-7. ORDERING INFORMATION

6-8. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate quantity required, and address the order to the nearest Hewlett-Packard office.

6-9. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

A . . . . . assembly
AT . . attenuator; isolator; termination
B . . . . . fan; motor
BT . . . . . battery
C . . . . . capacitor
CP . . . . . coupler
CR . . . . . diode; diode thyristor; varactor
DC . . . directional coupler
DL . . . . . delay line
DS . . . . . annunciator; signaling device (audible or visual); lamp; LED
E . . . . . miscellaneous electrical part
F . . . . . fuse
FL . . . . . filter
H . . . . . hardware
HY . . . . . circulator
J . . . electrical connector (stationary portion); jack
K . . . . . relay
L . . . . . coil; inductor
M . . . . . meter
MP . . . . . miscellaneous mechanical part
P . . . electrical connector (movable portion); plug
Q . . . . . transistor: SCR; triode thyristor
R . . . . . resistor
RT . . . . . thermistor
S . . . . . switch
T . . . . . transformer
TB . . . . . terminal board
TC . . . . . thermocouple
TP . . . . . test point
U . . . . . integrated circuit; microcircuit
V . . . . . electron tube
VR . . . . voltage regulator; breakdown diode
W . . . . cable; transmission path; wire
X . . . . . socket
Y . . . . crystal unit (piezoelectric or quartz)
Z . . . . tuned cavity; tuned circuit

ABBREVIATIONS

A . . . . . ampere
ac . . . . alternating current
ACCESS . . . . . accessory
ADJ . . . . . adjustment
A/D . . . . analog-to-digital
AF . . . . . audio frequency
AFC . . . . . automatic frequency control
AGC . . . . . automatic gain control
AL . . . . . aluminum
ALC . . . . . automatic level control
AM . . . amplitude modulation
AMPL . . . . . amplifier
APC . . . . automatic phase control
ASSY . . . . . assembly
AUX . . . . . auxiliary
avg . . . . . average
AWG . . . . American wire gauge
BAL . . . . . balance
BCD . . . . . binary coded decimal
BD . . . . . board
BE CU . . . . . beryllium copper
BFO . . . . . beat frequency oscillator
BH . . . . . binder head
BKDN . . . . . breakdown
BP . . . . . bandpass
BPF . . . . . bandpass filter
BRS . . . . . brass
BWO . . . . . backward-wave oscillator
CAL . . . . . calibrate
ccw . . counter-clockwise
CER . . . . . ceramic
CHAN . . . . . channel
cm . . . . . centimeter
CMO . . cabinet mount only
COAX . . . . . coaxial
COEF . . . . . coefficient
COM . . . . . common
COMP . . . . . composition
COMPL . . . . . complete
CONN . . . . . connector
CP . . . . . cadmium plate
CRT . . . cathode-ray tube
CTL . . . complementary transistor logic
CW . . . . . continuous wave
cw . . . . . clockwise
cm . . . . . centimeter
D/A . . . . digital-to-analog
dB . . . . . decibel
dBm . . . . decibel referred to 1 mW
dc . . . . . direct current
deg . . degree (temperature interval or difference)
° . . . . . degree (plane angle)
°C . . . . . degree Celsius (centigrade)
°F . . . . degree Fahrenheit
°K . . . . . degree Kelvin
DEPC . . deposited carbon
DET . . . . . detector
diam . . . . . diameter
DIA . . . diameter (used in parts list)
DIFF AMPL . . differential amplifier
DIP . . . dual in-line package
div . . . . . division
DPDT. . . . . double-pole, double-throw
DR . . . . . drive
DSB. . . . . doublesideband
DTL . . . . diode transistor logic
DVM . . . . digital voltmeter
ECL. . . . . emitter coupled logic
EMF . . electromotive force
EDP . . . . . electronic data processing
ELECT . . . . . electrolytic
ENCAP . . . . encapsulated
EXT . . . . . external
F . . . . . farad
FET . . . . . field-effect transistor
F/F . . . . . flip-flop
FH . . . . . flat head
FIL H . . . . . fillister head
FM . . frequency modulation
FP . . . . . front panel
FREQ . . . . . frequency
FXD . . . . . fixed
g . . . . . gram
GE . . . . . germanium
GHz . . . . . gigahertz
GL . . . . . glass
GND. . . . . ground(ed)
H . . . . . henry
h . . . . . hour
HET . . . . . heterodyne
HEX . . . . . hexagonal
HD . . . . . head
HDW . . . . . hardware
HF . . . . . high frequency
HG . . . . . mercury
HI . . . . . high
HP . . . . . Hewlett-Packard
HPF . . . . . high pass filter
HR . . . . . hour (used in parts list)
HV . . . . . high voltage
Hz . . . . . Hertz
IC . . . . integrated circuit
ID . . . . . inside diameter
IF . . . . . intermediate frequency
IMPG . . . . . impregnated
in . . . . . inch
INCD . . . . . incandescent
INCL . . . . . include(s)
INP . . . . . input
INS . . . . . insulation
INT . . . . . internal
kg . . . . . kilogram
kHz . . . . . kilohertz
kΩ . . . . . kilohm
kV . . . . . kilovolt
lb . . . . . pound
LC . . . . . inductance-capacitance
LED . . light-emitting diode
LF . . . . . low frequency
LG . . . . . long
LH . . . . . left hand
LIM . . . . . limit
LIN . . . linear taper (used in parts list)
lin . . . . . linear
LK WASH . . . lock washer
LO . . . low; local oscillator
LOG . . . . logrithmic taper (used in parts list)
log . . . . . logrithm(ic)
LPF . . . . . low pass filter
LV . . . . . low voltage
m . . . . . meter (distance)
mA . . . . . milliampere
MAX . . . . . maximum
MΩ . . . . . megohm
MEG . . . . meg (10^6) (used in parts list)
MET FLM . . . . metal film
MET OX . . metallic oxide
MF . . . medium frequency; microfarad (used in parts list)
MFR . . . . . manufacturer
mg . . . . . milligram
MHz . . . . . megahertz
mH . . . . . millihenry
mho . . . . . mho
MIN . . . . . minimum
min . . . . . minute (time)
. . . ' . . . . . minute (plane angle)
MINAT . . . . . miniature
mm . . . . . millimeter

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6-1. Reference Designations and Abbreviations (2 of 2)

MOD . . . . . modulator
MOM . . . . . momentary
MOS . . . . . metal-oxide semiconductor
ms . . . . . millisecond
MTG . . . . . mounting
MTR . . . meter (indicating device)
mV . . . . . millivolt
mVac . . . . . millivolt, ac
mVdc . . . . . millivolt, dc
mVpk . . . . millivolt, peak
mVp-p . . . millivolt, peak-to-peak
mVrms . . . . millivolt, rms
mW . . . . . milliwatt
MUX . . . . . multiplex
MY . . . . . mylar
μA . . . . . microampere
μF . . . . . microfarad
μH . . . . . microhenry
μmho . . . . . micromho
μs . . . . . microsecond
μV . . . . . microvolt
μVac . . . . . microvolt, ac
μVdc . . . . . microvolt, dc
μVpk . . . microvolt, peak
μVp-p . . . microvolt, peak-to-peak
μVrms . . . . microvolt, rms
μW . . . . . microwatt
nA . . . . . nanoampere
NC . . . . . no connection
N/C . . . . normally closed
NE . . . . . neon
NEG . . . . . negative
nF . . . . . nanofarad
NI PL . . . . . nickel plate
N/O . . . . . normally open
NOM . . . . . nominal
NORM . . . . . normal
NPN . . . negative-positive-negative
NPO . . . . negative-positive zero (zero temperature coefficient)
NRFR . . not recommended for field replacement
NSR . . . . . not separately replaceable
ns . . . . . nanosecond
nW . . . . . nanowatt
OBD . . . order by description
OD . . . . . outside diameter
OH . . . . . oval head
OP AMPL . . . operational amplifier
OPT . . . . . option
OSC . . . . . oscillator
OX . . . . . oxide
oz . . . . . ounce
Ω . . . . . ohm
P . . . . peak (used in parts list)
PAM . . . . pulse-amplitude modulation
PC . . . . . printed circuit
PCM . . pulse-code modulation; pulse-count modulation
PDM . . . . . pulse-duration modulation
pF . . . . . picofarad
PH BRZ phosphor bronze
PHL . . . . . Phillips
PIN . . . positive-intrinsic-negative
PIV . . . . . peak inverse voltage
pk . . . . . peak
PL . . . . . phase lock
PLO . . . . . phase lock oscillator
PM . . . . phase modulation
PNP . . . positive-negative-positive
P/O . . . . . part of
POLY . . . . . polystyrene
PORC . . . . . porcelain
POS . . positive; position(s) (used in parts list)
POSN . . . . . position
POT . . . . . potentiometer
p-p . . . . . peak-to-peak
PP . . . peak-to-peak (used in parts list)
PPM . . . . . pulse-position modulation
PREAMPL . . . preamplifier
PRF . . . . pulse-repetition frequency
PRR . . . . pulse repetition rate
ps . . . . . picosecond
PT . . . . . point
PTM . . . . . pulse-time modulation
PWM . . . . . pulse-width modulation
PWV . . . . . peak working voltage
RC . . . . . resistance-capacitance
RECT . . . . . rectifier
REF . . . . . reference
REG . . . . . regulated
REPL . . . . . replaceable
RF . . . . . radio frequency
RFI . . . . radio frequency interference
RH . . . . round head; right hand
RLC . . . . . resistance-inductance-capacitance
RMO . . . rack mount only
rms . . . . root-mean-square
RND . . . . . round
ROM . . read-only memory
R&P . . . . . rack and panel
RWV . . . reverse working voltage
S . . . scattering parameter
s . . . . . second (time)
. . . " . second (plane angle)
S-B . . . . . slow-blow (fuse) (used in parts list)
SCR . . . silicon controlled rectifier; screw
SE . . . . . selenium
SECT . . . . . sections
SEMICON . . . . . semiconductor
SHF . . . . . superhigh frequency
SI . . . . . silicon
SIL . . . . . silver
SIP . . single in-line package
SL . . . . . slide
SNR . . signal-to-noise ratio
SPDT . . . . . single-pole, double-throw
SPG . . . . . spring
SR . . . . . split ring
SPST . . . . . single-pole, single-throw
SSB . . . . . single sideband
SST . . . . . stainless steel
STL . . . . . steel
SQ . . . . . square
SWR . . standing-wave ratio
SYNC . . . . . synchronize
T . . timed (slow-blow fuse)
TA . . . . . tantalum
TC . . . . . temperature compensating
TD . . . . . time delay
TERM . . . . . terminal
TFT . . thin-film transistor
TGL . . . . . toggle
THD . . . . . thread
THRU . . . . . through
TI . . . . . titanium
TOL . . . . . tolerance
TRIM . . . . . trimmer
TSTR . . . . . transistor
TTL . . transistor-transistor logic
TV . . . . . television
TVI television interference
TWT . . traveling wave tube
U . . . . . micro (10^{-6}) (used in parts list)
UF . . . microfarad (used in parts list)
UHF . . ultrahigh frequency
UNREG . . . . unregulated
V . . . . . volt
VA . . . . . voltampere
Vac . . . . . volts, ac
VAR . . . . . variable
VCO . . . voltage-controlled oscillator
Vdc . . . . . volts, dc
VDCW . . volts, dc, working (used in parts list)
V(F) . . . . . volts, filtered
VFO . . variable-frequency oscillator
VHF . . . . . very-high frequency
Vpk . . . . . volts, peak
Vp-p . . volts, peak-to-peak
Vrms . . . . . volts, rms
VSWR . . . voltage standing wave ratio
VTO . . . . . voltage-tuned oscillator
VTVM . . . . vacuum-tube voltmeter
V(X) . . . . . volts, switched
W . . . . . watt
W/ . . . . . with
WIV . . . . working inverse voltage
WW . . . . . wirewound
W/O . . . . . without
YIG . . yttrium-iron-garnet
Z_o . . . . . characteristic impedance

NOTE

All abbreviations in the parts list will be in upper-case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08565-60049	1	ASSEMBLY, FRONT PANEL DISPLAY	28480	08565-60049
A1MP1	08565-40001	1	PANEL, FRONT CRT	28480	08565-40001
A1MP2	08565-00041		PANEL, FRONT LEFT LOWER (STANDARD)	28480	08565-00041
A1MP2	08565-00067		PANEL, FRONT LEFT LOWER (OPT 002)	28480	08565-00067
A1MP3	08565-00040	1	PANEL, FRONT LEFT DISPLAY	28480	08565-00040
A1MP4	08565-00039	1	PANEL, FRONT DISPLAY	28480	08565-00039
A1MP5	0370-2257	1	KNOB, BASE RIB(VIDEO FILTER)	28480	0370-2257
A1MP6	08565-00053	1	SKIRT, VIDEO FILTER	28480	08565-00053
A1MP7	5040-8805	9	KNOB, 5/16" SERIES	28480	5040-8805
A1MP8	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A1MP9	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A1MP10	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A1MP11	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A1MP12	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A1MP13	0350-1012	6	DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP14	0350-1012		DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP15	0350-1012		DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP16	0350-1012		DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP17	0350-1012		DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP18	0350-1012		DECAL-KB CAP 5/16 IN-SER	28480	0350-1012
A1MP19	5040-8817	13	PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A1MP20	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A1MP21	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A1MP22	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A1MP23	5040-8819	5	PUSHBUTTON, SQUARE, WILLOW GREEN	28480	5040-8819
A1MP24	5040-8821	13	PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A1MP25	0370-0606	29	BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP26	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP27	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP28	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP29	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP30	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A1MP31	3030-0051	12	SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP32	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP33	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP34	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP35	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP36	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP37	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP38	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP39	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP40	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP41	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1MP42	3030-0051		SCREW-SET 4-40 .094-IN-LG SMALL CUP-PT	28480	3030-0051
A1A1	08565-60035	1	ASSEMBLY, BEZEL DISPLAY	28480	08565-60035
A1A1D81	1990-0582	24	LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D82	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D83	1990-0446	8	DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D84	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D85	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D86	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D87	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D88	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D89	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D810	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D811	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D812	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D813	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D814	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D815	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D816	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D817	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D818	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D819	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D820	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D821	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D822	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D823	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1D824	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1D825	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1DS26	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1DS27	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1DS28	1990-0446		DISPLAY-NUM SEG 4-CHAR .11-H	28480	1990-0446
A1A1DS29	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1DS30	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1DS31	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1DS32	1990-0582		LED-VISIBLE LUM-INT=3MCD IF=60MA-MAX	28480	1990-0582
A1A1J1	1251-3691	2	CONNECTOR 36-PIN M POST TYPE	28480	1251-3691
A1A1J2	1251-3691		CONNECTOR 36-PIN M POST TYPE	28480	1251-3691
A1A1MP1	08565-40012	1	REFLECTOR	28480	08565-40012
A1A1MP2	08565-40008	4	REFLECTOR	28480	08565-40008
A1A1MP3	08565-40008		REFLECTOR	28480	08565-40008
A1A1MP4	08565-40008		REFLECTOR	28480	08565-40008
A1A1MP5	08565-40008		REFLECTOR	28480	08565-40008
A1A1MP6	08565-40007	3	REFLECTOR	28480	08565-40007
A1A1MP7	08565-40007		REFLECTOR	28480	08565-40007
A1A1MP8	08565-40007		REFLECTOR	28480	08565-40007
A1A2	08565-60007	1	ASSEMBLY, DISPLAY SWITCH	28480	08565-60007
A1A2C1	0180-0197	37	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A1A2C2	0180-0229	5	CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A1A2CR1	1901-0050	345	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A1A2CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A1A2CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A1A2CR4	1910-0016	4	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A2J1	1200-0507	6	SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A1A2R1	2100-3631	5	RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3631
A1A2R2	2100-3634	1	RESISTOR-VAR CONTROL CP 2.5M 20% LIN	28480	2100-3634
A1A2R3	2100-3633	1	RESISTOR-VAR CONTROL CP 1K 10% LIN	28480	2100-3633
A1A2R4	2100-3632	1	RESISTOR-VAR CONTROL CP 2K 10% LIN	28480	2100-3632
A1A2R5	2100-3630	1	RESISTOR-VAR CONTROL CP 20K 10% LIN	28480	2100-3630
A1A2R6	2100-3631		RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3631
A1A2R7	0757-0447	10	RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A1A2R8	0757-0442	120	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A2R9	0757-0279	63	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A1A2R10	0757-0278	8	RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A1A2R11	2100-3214	1	RESISTOR-TRMR 100K 10% C TOP-ADJ 1-TRN	73138	72-112-0
A1A2R12	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A1A2R13	0757-0280	56	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2S1	3101-2189	2	SWITCH-PB DPDT MOM .125A 28VAC	28480	3101-2189
A1A2S2	3101-2183	1	SWITCH-PB 4-STATION 20MM C-C SPACING	28480	3101-2183
A1A2VR1	1902-0041	6	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-9B
A2	08565-60001	1	ASSEMBLY, FRONT PANEL CONTROL	28480	08565-60001
A2J1			SEE FIGURE 6-1		
A2J2			PART OF W11		
A2MP1	08565-00001	1	PANEL, FRONT DRESS	28480	08565-00001
A2MP2	08565-00003	1	PANEL, SUB-FRONT	28480	08565-00003
A2MP3	08565-20040	1	WINDOW, FREQ. DISPLAY	28480	08565-20040
	08565-20043	2	SHAFT, FREQ. SPAN	28480	08565-20043
A2MP4	08565-20008	1	KNOB, FINE TUNE	28480	08565-20008
A2MP5	08565-60041	1	KNOB ASSEMBLY, COARSE TUNING	28480	08565-60041
A2MP6	08565-60043	1	KNOB ASSEMBLY, FREQ SPAN/DIV	28480	08565-60043
A2MP7	08565-60044	1	KNOB ASSEMBLY, RES BW (STANDARD)	28480	08565-60044
A2MP7	08565-60050	1	KNOB ASSEMBLY, RES BW (OPTION 100)	28480	08565-60050
A2MP8	08565-60045	1	KNOB ASSEMBLY, REFERENCE LEVEL	28480	08565-60045
A2MP9	08565-40011	1	POINTER, INPUT ATTENUATOR	28480	08565-40011
A2MP10	08565-00043	1	DISK, INDEX (REF LEVEL DBM)	28480	08565-00043
A2MP11	08565-60047	1	KNOB ASSEMBLY, REFERENCE LEVEL, FINE	28480	08565-60047
A2MP12	08565-60042	1	KNOB ASSEMBLY, SWEEP TIME/DIV.	28480	08565-60042
A2MP13	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A2MP14	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A2MP15	5040-8805		KNOB, 5/16" SERIES	28480	5040-8805
A2MP16 THRU					
A2MP38	0370-0606		BEZEL;PUSHBUTTON KNOB, JADE GRAY	28480	0370-0606
A2MP39	5040-8816	2	PUSHBUTTON, SQUARE, MINT GRAY	28480	5040-8816
A2MP40	5040-8816		PUSHBUTTON, SQUARE, MINT GRAY	28480	5040-8816
A2MP41	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP42	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP43	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP44	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2MP45	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP46	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP47	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP48	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP49	5040-8817		PUSHBUTTON, SQUARE, JADE GRAY	28480	5040-8817
A2MP50	5040-8819		PUSHBUTTON, SQUARE, WILLOW GREEN	28480	5040-8819
A2MP51	5040-8819		PUSHBUTTON, SQUARE, WILLOW GREEN	28480	5040-8819
A2MP52	5040-8819		PUSHBUTTON, SQUARE, WILLOW GREEN	28480	5040-8819
A2MP53	5040-8819		PUSHBUTTON, SQUARE, WILLOW GREEN	28480	5040-8819
A2MP54	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP55	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP56	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP57	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP58	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP59	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP60	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP61	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP62	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP63	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP64	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP65	5040-8821		PUSHBUTTON, SQUARE, OLIVE GRAY	28480	5040-8821
A2MP66	5040-8823	1	KNOB, MINT GRAY	28480	5040-8823
A2MP67	08557-20025	1	SHAFT, REF LEVEL, FINE	28480	08557-20025
A2MP68	08558-00019	1	DETENT ATTENUATOR	28480	08558-00019
A2MP69	08558-00020	1	DETENT, I.F. GAIN	28480	08558-00020
A2MP70	08558-00021	1	PLATE,LEVEL POT	28480	08558-00021
A2MP71	08558-00022	1	CRANK,SLOTTED	28480	08558-00022
A2MP72	08558-20058	1	HUB,COUPLING	28480	08558-20058
A2MP73	08558-20059	5	HUB,D "XNING	28480	08558-20059
A2MP74	08558-20059		HUB,DRIVE	28480	08558-20059
A2MP75	08558-20059		HUB,DRIVE	28480	08558-20059
A2MP76	08558-20059		HUB,DRIVE	28480	08558-20059
A2MP77	08558-20061	1	LOCKOUT,ROTATING	28480	08558-20061
A2MP78	08558-20062	1	LOCKOUT, FIXED	28480	08558-20062
A2MP79	08558-20089	1	BUSHING, SLOTTED	28480	08558-20089
A2MP80	08558-40005	2	ROTOR, DOUBLE CONTACT (ATTENUATOR)	28480	08558-40005
A2MP81	08558-40005		ROTOR, DOUBLE CONTACT (RF LEVEL)	28480	08558-40005
A2MP82	08565-00005	1	DETENT,BANDWIDTH	28480	08565-00005
A2MP83	08565-00006	2	DETENT (FREQ, SPAN)	28480	08565-00006
A2MP84	08565-20009	1	ROTOR (FREQ, SPAN)	28480	08565-20009
A2MP85	08565-20044	1	SHAFT, RESISTOR BANDWIDTH	28480	08565-20044
A2MP86	08565-20045	1	SHAFT, REFERENCE LEVEL	28480	08565-20045
A2MP87	08565-20046	1	SHAFT, FIXED	28480	08565-20046
A2MP88	08565-20049	2	BUSHING, FREQ, SPAN	28480	08565-20049
A2MP89	08565-20049		BUSHING, REF LEVEL	28480	08565-20049
A2MP90	08565-20050	1	NUT, POINT/RETAINER	28480	08565-20050
A2MP91	08565-20094	1	ROTOR, BANDWIDTH	28480	08565-20094
A2MP92	2200-0155	1	SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0155
A2MP93	2200-0165	2	SCREW-MACH 4-40 .25-IN-LG 82 DEG	28480	2200-0165
A2MP94	2200-0165		SCREW-MACH 4-40 .25-IN-LG 82 DEG	28480	2200-0165
A2MP95	2200-0509	2	SCREW-MACH 4-40 1.625-IN-LG PAN-HD-POZI	28480	2200-0509
A2MP96	2200-0509		SCREW-MACH 4-40 1.625-IN-LG PAN-HD-POZI	28480	2200-0509
A2MP97	2200-0558	3	SCREW-MINTR 4-40 2.25-IN-LG PAN-HD-POZI	28480	2200-0558
A2MP98	2200-0558		SCREW-MINTR 4-40 2.25-IN-LG PAN-HD-POZI	28480	2200-0558
A2MP99	2200-0558		SCREW-MINTR 4-40 2.25-IN-LG PAN-HD-POZI	28480	2200-0558
A2MP100 THRU A2MP104			NOT ASSIGNED		
A2MP105	0380-0440	1	SPACER-RND .75LG .129ID .188OD BRS	76854	2295-448
A2MP106	0380-0441	1	SPACER-RND .875LG .129ID .188OD BRS	76854	2295-456
A2MP107	0510-0089	1	RETAINER-RING BSC EXT .188-DIA BE-CU	05738	3100-18-BC-CD
A2MP108	1410-0006	5	BALL BEARING TYPE, 0.1875" DIA	78700	GRADE 50 TYPE 440C
A2MP109	1410-0006		BALL BEARING TYPE, 0.1875" DIA	78700	GRADE 50 TYPE 440C
A2MP110	1410-0006		BALL BEARING TYPE, 0.1875" DIA	78700	GRADE 50 TYPE 440C
A2MP111	1410-0006		BALL BEARING TYPE, 0.1875" DIA	78700	GRADE 50 TYPE 440C
A2MP112	1410-0730	2	BUSHING-PNL .127-ID .375-LG 1/4-28-THD	0447E	18-18-1
A2MP113	1460-0532	1	SPRING-CPRSN .54-IN-OD .45-IN-LG MUW	28480	1460-0532
A2MP114	1460-0578	5	SPRING-CPRSN .18-IN-OD .312-IN-LG MUW	28480	1460-0578
A2MP115	1460-0578		SPRING-CPRSN .18-IN-OD .312-IN-LG MUW	28480	1460-0578
A2MP116	1460-0578		SPRING-CPRSN .18-IN-OD .312-IN-LG MUW	28480	1460-0578
A2MP117	1460-0578		SPRING-CPRSN .18-IN-OD .312-IN-LG MUW	28480	1460-0578
A2MP118	1460-1376	1	SPRING-TRSN MUW	28480	1460-1376
A2MP119	2950-0006	1	NUT-HEX-DBL-CHAM 1/4-32-THD .094-IN-THK	0460D	9000
A2MP120	2950-0043	4	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
A2MP121	2950-0043		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
A2MP122	2950-0043		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2MP123	2950-0043		NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0043
A2MP124	2950-0051	2	NUT-HEX-DBL-CHAM 1/4-28-THD .094-IN-THK	28480	2950-0051
A2MP125	3030-0007	16	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP126	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP127	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP128	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP129	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP130	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP131	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP132	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP133	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP134	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP135	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP136	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP137	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP138	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2MP139	2190-0027	2	WASHER-LK INTL T 1/4 IN .256-IN-ID	78189	1914-00
A2MP140	2190-0027		WASHER-LK INTL T 1/4 IN .256-IN-ID	78189	1914-00
A2MP141	2190-0368	5	WASHER-FL MTLC NO. 5 .13-IN-ID	28480	2190-0368
A2MP142	2190-0368		WASHER-FL MTLC NO. 5 .13-IN-ID	28480	2190-0368
A2MP143	2200-0101	10	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP144	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP145	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP146	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP147	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP148	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP149	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP150	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP151	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP152	2200-0101		SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A2MP153	2200-0109	14	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A2MP154	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A2MP155	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A2MP156	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A2MP157	2200-0151	6	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A2MP158	2200-0151		SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A2MP159	2200-0151		SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A2MP160	0380-0034	3	SPACER-RND .312LG .116ID .188OD BRS	28480	0380-0034
A2MP161	0380-0034		SPACER-RND .312LG .116ID .188OD BRS	28480	0380-0034
A2MP162	0380-0034		SPACER-RND .312LG .116ID .188OD BRS	28480	0380-0034
A2MP163	0380-0411	12	SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP164	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP165	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP166	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP167	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP168	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP169	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP170	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP171	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP172	0380-0411		SPACER-RND .5LG .114ID .154OD BRS	76854	3-5162-111
A2MP173 THRU					
A2MP189	2260-0001	18	NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
A2MP190	2260-0002	17	NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A2MP191	1480-0059	8	PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP192	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP193	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP194	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP195	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP196	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP197	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP198	1480-0059		PIN,SPRING 0.062" NOM. DIA	28480	1480-0059
A2MP199	1480-0367	1	PIN, DOWEL 303 SST	28480	1480-0367
A2MP200	2190-0016	3	WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A2MP201	2190-0016		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A2MP202	2190-0019	10	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP203	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP204	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP205	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP206	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP207	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP208	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP209	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2MP210	08565-20043		SHAFT, FREQ. SPAN	28480	08565-20043
A2R1	2100-3625	1	RESISTOR-VAR CONTROL WW 10K 5% LIN	02588	49M

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1	08565-60002	1	ASSEMBLY, FRONT SWITCH	28480	08565-60002
A2A1CR1 THRU A2A1CR28	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A2A1DS1	1990-0485	2	LED-VISIBLE LUM-INT=800UCD IF=30MA-MAX	28480	1990-0485
A2A1DS2	1990-0485		LED-VISIBLE LUM-INT=800UCD IF=30MA-MAX	28480	1990-0485
A2A1DS3	1990-0487	9	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A2A1J1	1251-3906	1	CONNECTOR 50-PIN M RECTANGULAR	76381	3413-2003
A2A1J2	1251-3025	1	CONNECTOR 34-PIN M RECTANGULAR	76381	3411-2002
A2A1R1	2100-3635	1	RESISTOR-VAR CONTROL CP 100K 10% LIN	28480	2100-3635
A2A1R2	2100-3631		RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3631
A2A1R3	0757-0814	1	RESISTOR 511 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-511R-F
A2A1R4	0757-0465	99	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A2A1R5			NOT ASSIGNED		
A2A1R6	2100-3631		RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3631
A2A1R7	2100-3631		RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3631
A2A1R8	0757-0198	1	RESISTOR 100 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-101-F
A2A1R9	2100-3650	1	RESISTOR-VAR CONTROL CP 10K 10% LIN	28480	2100-3650
A2A1R10	0698-3444	32	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A2A1R11	2100-3651	1	RESISTOR-VAR CONTROL CP 2K 10% LIN	28480	2100-3651
A2A1R12	0698-0084	14	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A2A1S1	3101-2124	1	SWITCH-PB DPDT ALTNG	28480	3101-2124
A2A1S2	3101-2186	1	SWITCH-PB 3-STATION 10MM C-C SPACING	28480	3101-2186
A2A1S3	3101-2182	2	SWITCH-PB 5-STATION 10MM C-C SPACING	28480	3101-2182
A2A1S4	3101-2181	1	SWITCH-PB 5-STATION 10MM C-C SPACING	28480	3101-2181
A2A1S5	3101-2182		SWITCH-PB 5-STATION 10MM C-C SPACING	28480	3101-2182
A2A1S6	3101-2184	1	SWITCH-PB 8-STATION 15MM C-C SPACING	28480	3101-2184
A2A1S7	3101-2189		SWITCH-PB DPDT MOM .125A 28VAC	28480	3101-2189
A2A1XDS1	1200-0010	3	SOCKET-TUBE 2-CONT	0450G	133-52-12-016
A2A1XDS2	1200-0010		SOCKET-TUBE 2-CONT	0450G	133-52-12-016
A2A1XDS3	1200-0010		SOCKET-TUBE 2-CONT	0450G	133-52-12-016
A2A2	08565-60003	1	ASSEMBLY, FREQUENCY DISPLAY	28480	08565-60003
A2A2DS1	1990-0513	5	DISPLAY-NUM SEG 1-CHAR .3-H GA-ARSD-PPHD	28480	1990-0513
A2A2DS2	1990-0513		DISPLAY-NUM SEG 1-CHAR .3-H GA-ARSD-PPHD	28480	1990-0513
A2A2DS3	1990-0513		DISPLAY-NUM SEG 1-CHAR .3-H GA-ARSD-PPHD	28480	1990-0513
A2A2DS4	1990-0513		DISPLAY-NUM SEG 1-CHAR .3-H GA-ARSD-PPHD	28480	1990-0513
A2A2DS5	1990-0513		DISPLAY-NUM SEG 1-CHAR .3-H GA-ARSD-PPHD	28480	1990-0513
A2A2J1	1200-0507		SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A2A2R1	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R2	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R3	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R4	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R5	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R6	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R7	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2R8	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A2A2XDS1	1200-0508	6	SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A2A2XDS2	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A2A2XDS3	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A2A2XDS4	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A2A2XDS5	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A2A3	08565-60006	1	ASSEMBLY, TUNING	28480	08565-60006
A2A3MP1	08565-20098	1	PLATE, T/M FRONT	28480	08565-20098
A2A3MP2	08565-20099	1	PLATE, T/M REAR	28480	08565-20099
A2A3MP3	08565-00021	1	BRACKET, FINE TUNE	28480	08565-00021
A2A3MP4	08565-20041	1	SHAFT, COARSE TUNE	28480	08565-20041
A2A3MP5	08565-20042	1	SHAFT, FINE TUNE	28480	08565-20042
A2A3MP6	08555-20095	1	CLUTCH, PINION ASSEMBLY	28480	08555-20095
A2A3MP7	08555-20096	1	GEAR, PINION ASSEMBLY	28480	08555-20096
A2A3MP8	08555-20020	1	PINION, 30 TEETH	28480	08555-20020
A2A3MP9	08555-20013	1	CONE DRIVE	28480	08555-20013
A2A3MP10	08555-20011	1	BEARING, REAR	28480	08555-20011
A2A3MP11	08555-20005	1	GEAR, CLUTCH & DIAL	28480	08555-20005
A2A3MP12	08565-20048	3	STANDOFF	28480	08565-20048
A2A3MP13	08565-20048		STANDOFF	28480	08565-20048
A2A3MP14	08565-20048		STANDOFF	28480	08565-20048
A2A3MP15	0510-0028	1	RETAINER-RING BSC EXT .375-DIA STL	0573B	3100-37-ST-CD
A2A3MP16	0510-0035	2	RETAINER-RING BWD EXT .375-DIA STL	0573B	3101-37-ST-CD
A2A3MP17	0510-0035		RETAINER-RING BWD EXT .375-DIA STL	0573B	3101-37-ST-CD
A2A3MP18	0510-0082	2	RETAINER-RING BSC EXT .125-DIA BE-CU	0573B	3100-12-BC
A2A3MP19	0510-0082		RETAINER-RING BSC EXT .125-DIA BE-CU	0573B	3100-12-BC
A2A3MP20	0510-1140	1	RETAINER-RING "C"-RND EXT .312-DIA STL	28480	0510-1140

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A3MP21	1410-0226	4	BALL BEARING:STL 0.09375" DIA	28480	1410-0226
A2A3MP22	1410-0226		BALL BEARING:STL 0.09375" DIA	28480	1410-0226
A2A3MP23	1410-0226		BALL BEARING:STL 0.09375" DIA	28480	1410-0226
A2A3MP24	1410-0226		BALL BEARING:STL 0.09375" DIA	28480	1410-0226
A2A3MP25	1430-0713	2	GEAR, MITER 18-TEETH	28480	1430-0713
A2A3MP26	1430-0713		GEAR, MITER 18-TEETH	28480	1430-0713
A2A3MP27	1460-1213	4	SPRING-CPRSN .088-IN-OD .33-IN-LG MUW	28480	1460-1213
A2A3MP28	1460-1213		SPRING-CPRSN .088-IN-OD .33-IN-LG MUW	28480	1460-1213
A2A3MP29	1460-1213		SPRING-CPRSN .088-IN-OD .33-IN-LG MUW	28480	1460-1213
A2A3MP30	1460-1213		SPRING-CPRSN .088-IN-OD .33-IN-LG MUW	28480	1460-1213
A2A3MP31	2190-0368		WASHER-FL MTLC NO. 5 .13-IN-ID	28480	2190-0368
A2A3MP32	2190-0368		WASHER-FL MTLC NO. 5 .13-IN-ID	28480	2190-0368
A2A3MP33	2190-0926	1	WASHER-SPR CRVD NO. 5 .14-IN-ID	78189	3502-05-21-0541
A2A3MP34	2200-0103	46	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A3MP35	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A2A3MP36	2360-0135	3	SCREW-MACH 6-32 1.5-IN-LG PAN-HD-POZI	28480	2360-0135
A2A3MP37	2360-0135		SCREW-MACH 6-32 1.5-IN-LG PAN-HD-POZI	28480	2360-0135
A2A3MP38	2360-0135		SCREW-MACH 6-32 1.5-IN-LG PAN-HD-POZI	28480	2360-0135
A2A3MP39	2420-0001	3	NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	28480	2420-0001
A2A3MP40	2420-0001		NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	28480	2420-0001
A2A3MP41	2420-0001		NUT-HEX-W/LKWR 6-32-THD .109-IN-THK	28480	2420-0001
A2A3MP42	3030-0014	10	SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP43	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP44	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP45	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP46	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP47	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP48	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP49	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP50	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP51	3030-0014		SCREW-SET 4-40 .125-IN-LG FLAT-PT ALY	28480	3030-0014
A2A3MP52	3050-0029	3	WASHER-FL MTLC 3/8 IN .378-IN-ID	28480	3050-0029
A2A3MP53	3050-0029		WASHER-FL MTLC 3/8 IN .378-IN-ID	28480	3050-0029
A2A3MP54	3050-0029		WASHER-FL MTLC 3/8 IN .378-IN-ID	28480	3050-0029
A2A3MP55	3050-0153	3	WASHER-FL MTLC 1/4 IN .26-IN-ID	28480	3050-0153
A2A3MP56	3050-0153		WASHER-FL MTLC 1/4 IN .26-IN-ID	28480	3050-0153
A2A3MP57	3050-0153		WASHER-FL MTLC 1/4 IN .26-IN-ID	28480	3050-0153
A2A3R1	2100-3615	1	RESISTOR-VAR PREC W/CP 10-TRN 10K 10%	28480	2100-3615
A2A3R2	2100-3621	1	RESISTOR-VAR PREC WW 10-TRN 10K 1%	0188E	534-9856
A2A3R3	2100-3614	1	RESISTOR-VAR PREC W/CP 3-TRN 15K 10%	28480	2100-3614
A2A3W1	08565-60083	1	CABLE ASSEMBLY, TUNING	28480	08565-60083
A2A4	08565-60004	1	ASSEMBLY, REAR SWITCH	28480	08565-60004
A2A4J1	1251-4736	4	CONNECTOR 26-PIN M RECTANGULAR	76381	3463-2003
A2A4MP1	08565-00006		DETENT(SWEEP TIME)	28480	08565-00006
A2A4MP2	08565-20055	1	BUSHING	28480	08565-20055
A2A4MP3	08565-20056	1	SHAFT (SWEEP TIME CONTROL)	28480	08565-20056
A2A4MP4	08565-20095	1	ROTOR, SWEEP TIME	28480	08565-20095
A2A4MP5	5020-0324	1	SHAFT (SWEEP TIME)	28480	5020-0324
A2A4MP6	08558-20059		HUB DRIVE	28480	08558-20059
A2A4MP7	0380-0411		SPACER-RND .5LG .114ID .1540D BRS	76854	3-5162-111
A2A4MP8	0380-0411		SPACER-RND .5LG .114ID .1540D BRS	76854	3-5162-111
A2A4MP9	0510-0015	1	RETAINER-RING E-R EXT .125-DIA STL	05738	1000-12-ST-CD
A2A4MP10	1410-0006		BALL BEARING TYPE, 0.1875" DIA	78700	GRADE 50 TYPE 440C
A2A4MP11	1410-0730		BUSHING-PNL .127-ID .375-LG 1/4-28-THD	0447E	1818-1
A2A4MP12	1430-0555	2	GEAR, SPUR 48-TEETH	6F68I	IT2-Y4848
A2A4MP13	1430-0555		GEAR, SPUR 48-TEETH	6F68I	IT2-Y4848
A2A4MP14	1460-0578		SPRING-CPRSN .18-IN-OD .312-IN-LG MUW	28480	1460-0578
A2A4MP15	2190-0016		WASHER-LK INTL T 3/8 IN .377-IN-ID	28480	2190-0016
A2A4MP16	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2A4MP17	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A2A4MP18	2190-0368		WASHER-FL MTLC NO. 5 .13-IN-ID	28480	2190-0368
A2A4MP19	2200-0151		SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A2A4MP20	2200-0151		SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A2A4MP21	2260-0001		NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
A2A4MP22	2260-0001		NUT-HEX-DBL-CHAM 4-40-THD .094-IN-THK	28480	2260-0001
A2A4MP23	2950-0001	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-IN-THK	28480	2950-0001
A2A4MP24	2950-0051		NUT-HEX-DBL-CHAM 1/4-28-THD .094-IN-THK	28480	2950-0051
A2A4MP25	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2A4MP26	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A2A4MP27	3050-0028	1	WASHER-FL MTLC NO. 12 .25-IN-ID	28480	3050-0028
A2A5	08565-60005	1	ASSEMBLY, REFERENCE LEVEL ENCODER	28480	08565-60005

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A5MP1	08654-20054	1	ROTOR ASSEMBLY, PC	28480	08654-20054
A2A5MP2	08565-20058	1	HUB, ROTARY SWITCH	28480	08565-20058
A2A5MP3	3050-0161	1	WASHER-SPR WAVY 1/4 IN .265-IN-ID	0442F	R-2
A2A5MP4	3050-0156	3	WASHER-FL MTLC NO. 12 .25-IN-ID	28480	3050-0156
A2A5MP5	3050-0156		WASHER-FL MTLC NO. 12 .25-IN-ID	28480	3050-0156
A2A5MP6	3050-0156		WASHER-FL MTLC NO. 12 .25-IN-ID	28480	3050-0156
A2A5MP7	0510-0005	1	RETAINER-RING SSC EXT .25-DIA STL	28480	0510-0005
A3	08565-60038	1	ASSEMBLY, DISPLAY ADJUST	28480	08565-60038
A3R1	2100-3628	1	RESISTOR-VAR CONTROL CP 50K 10% LIN	28480	2100-3628
A3R2	2100-3629	3	RESISTOR-VAR CONTROL CP 5K 10% LIN	28480	2100-3629
A3R3	2100-3629		RESISTOR-VAR CONTROL CP 5K 10% LIN	28480	2100-3629
A3R4	2100-3629		RESISTOR-VAR CONTROL CP 5K 10% LIN	28480	2100-3629
A4	08565-60053	1	ASSEMBLY, Z-AXIS AMPLIFIER	28480	08565-60053
A4C1	0180-0374	8	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A4C2	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A4C3	0160-3670	9	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A4C4	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4C5	0160-2055	297	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4C6	0160-2308	2	CAPACITOR-FXD 36PF +-5% 300VDC	28480	0160-2308
A4C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4C8	0121-0474	1	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A4C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4C10	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A4C11	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A4C12	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A4C13	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A4CR1	1901-0518	6	DIODE-SCHOTTKY	28480	1901-0518
A4CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4CR3	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A4CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4CR5	1901-0096	2	DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A4CR6	1901-0028	8	DIODE-PWR RECT 400V 750MA DO-29	0271C	MP493
A4CR7	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MP493
A4CR8	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A4CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4CR11	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A4CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4L1	9140-0210	29	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A4L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A4L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A4MP1	1200-0185		INSULATOR-XSTR NYLON	0260H	7717-86N RED
A4MP2	1200-0185		INSULATOR-XSTR NYLON	0260H	7717-86N RED
A4MP3	1200-0185		INSULATOR-XSTR NYLON	0260H	7717-86N RED
A4MP4	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A4MP5	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A4MP6	1480-0073	27	PINIDRIVE 0.250" LG	28480	1480-0073
A4MP7	4040-0751	2	EXTRACTOR-PC BOARD ORN POLYC	28480	4040-0751
A4Q1	1853-0038	7	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A4Q2	1854-0419	1	TRANSISTOR NPN SI TO-39 PD=1W FT=200MHZ	28480	1854-0419
A4Q3	1854-0404	208	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4Q4	1853-0036	1	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A4Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4Q6	1855-0327	2	TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	0169H	2N4416
A4Q7	1855-0327		TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	0169H	2N4416
A4Q8	1853-0007	72	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A4Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A4Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4Q11	1854-0039	2	TRANSISTOR NPN 2N3053B SI TO-39 PD=1W	0203G	2N3053
A4R1	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4R2	0698-3450	26	RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A4R3	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4R4	0757-0458	25	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4R5	0757-0441	7	RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4R6	0757-1094	13	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4R7	0757-0839	2	RESISTOR 10K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1002-F
A4R8	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4R9	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4R10	0698-0082	5	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R11	0757-0199	230	RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A4R12	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A4R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4R15	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4R16	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4R17	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4R18	2100-3207	2	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	72-145-0
A4R19	0698-3162	15	RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A4R20	0698-3152	9	RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A4R21	0698-3418	1	RESISTOR 26.1K 1% .5W F TC=0+-100	0552D	CMF-65-2
A4R22	0757-0839		RESISTOR 10K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1002-F
A4R23	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A4R24	0757-0346	52	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4R25	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4R26	0698-3413	2	RESISTOR 13.3K 1% .5W F TC=0+-100	0552D	CMF-65-2
A4R27	0698-3413		RESISTOR 13.3K 1% .5W F TC=0+-100	0552D	CMF-65-2
A4R28	0757-0424	3	RESISTOR 1.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1101-F
A4R29	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4R30	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4R31	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4R32	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4R33	0698-3455	2	RESISTOR 261K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2613-F
A4R34	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4U1	1820-1208	1	IC GATE TTL LS OR QUAD 2-INP	0291J	74LS32A
A4U2	1820-1144	5	IC GATE TTL LS NOR QUAD 2-INP	0223G	9LS02PC
A4U3	1820-1199	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS04N
A4VR1			NOT ASSIGNED		
A4VR2	1902-3203	2	DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	0223G	FZ7206
A4VR3	1902-3234	1	DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073%	0223G	FZ7288
A5	08565-60052	2	ASSEMBLY, Y-DEFLECTION AMPLIFIER	28480	08565-60052
A5C1	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A5C2	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A5C3	0160-4084	20	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A5C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A5C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A5C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A5C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C9	0160-3533	4	CAPACITOR-FXD 470PF +-5% 300VDC MICA0+70	28480	0160-3533
A5C10	0160-2236	10	CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A5C11	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A5C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A5C16	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A5C17	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A5C18	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A5CR1	1901-0040	19	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A5CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A5CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A5CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A5L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	0217B	15-1315-12J
A5L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	0217B	15-1315-12J
A5L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	0217B	15-1315-12J
A5MP1	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A5MP2	4040-0750	4	EXTRACTOR-PC BOARD RED POLYC	28480	4040-0750
A5MP3	1200-0185		INSULATOR-XSTR NYLON	0260M	7717-86N RED
A5MP4	1200-0185		INSULATOR-XSTR NYLON	0260M	7717-86N RED
A5MP5	1200-0185		INSULATOR-XSTR NYLON	0260M	7717-86N RED
A5MP6	1200-0185		INSULATOR-XSTR NYLON	0260M	7717-86N RED
A5MP7	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A5MP8	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A5MP9	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A5MP10	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A5Q1	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A5Q2	1854-0523	7	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A5Q3	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A5Q4	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A5Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q15	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A5Q16	1855-0052	1	TRANSISTOR MOSFET P-CHAN D-MODE TO-92 SI	0223G	2N4360
A5Q17	1855-0020	50	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A5R1	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A5R2	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	0160G	CC
A5R3	0757-0278		RESISTOR 1,78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A5R4	0698-3150	5	RESISTOR 2,37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A5R5	0698-3155	21	RESISTOR 4,64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A5R6	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	0160G	CC
A5R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A5R8	0757-0401	58	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A5R9	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A5R10	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A5R11	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A5R12	0757-0417	4	RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A5R13	0757-0417		RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A5R14	0757-0440		RESISTOR 7,5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A5R15	0757-0444	14	RESISTOR 12,1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A5R16	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A5R17	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A5R18	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A5R19	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A5R20	0698-3155		RESISTOR 4,64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A5R21	0757-1094		RESISTOR 1,47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A5R22	0757-0460	2	RESISTOR 61,9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A5R23	0757-0460		RESISTOR 61,9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A5R24	0698-3150		RESISTOR 2,37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A5R25	0698-3150		RESISTOR 2,37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A5R26	0757-0420	8	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A5R27	2100-3351	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A5R28	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A5R29	0698-3415	2	RESISTOR 19.6K 1% .5W F TC=0+-100	0552D	CMF-65-2
A5R30	0698-3415		RESISTOR 19.6K 1% .5W F TC=0+-100	0552D	CMF-65-2
A5R31	0757-0439	25	RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A5R32	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A5R33	0757-0438	34	RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A5R34	0757-0438		RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A5R35	0757-0856	2	RESISTOR 75K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-7502-F
A5R36	0757-0856		RESISTOR 75K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-7502-F
A5R37	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A5R38	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A5R39	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A5R40	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A5R41	0698-3406	2	RESISTOR 1,33K 1% .5W F TC=0+-100	0552D	CMF-65-2
A5R42	0698-3406		RESISTOR 1,33K 1% .5W F TC=0+-100	0552D	CMF-65-2
A5R43	0698-3260	40	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A5R44	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A6	08565-60052		ASSEMBLY, X-DEFLECTION AMPLIFIER SAME AS A5, USE A6 PREFIX	28480	08565-60052
A7	08565-60039	1	ASSEMBLY, STORAGE	28480	08565-60039
A7C1	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A7C2	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A7C3	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A7C4	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A7C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7C6	0160-0163	4	CAPACITOR-FXD .033UF +-10% 200VDC POLYE	0420J	295P33392
A7C7	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A7C8	0160-0194	1	CAPACITOR-FXD .015UF +-10% 200VDC POLYE	0420J	295P15392
A7C9	0160-0168	4	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	295P10492
A7C10	0160-0168		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	295P10492

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7C11	0180-0117	1	CAPACITOR-FXD 2.7UF+-10% 35VDC TA	0420J	150D275X9035B2
A7C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7C13	0180-2205	2	CAPACITOR-FXD .33UF+-10% 35VDC TA	0420J	150D334X9035A2
A7C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7C15	0180-0376	1	CAPACITOR-FXD .47UF+-10% 35VDC TA	0420J	150D474X9035A2
A7C16	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A7C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A7C18	0160-3456	29	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7C19	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A7C20	0160-3466	7	CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A7C21	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A7CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR5	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MP493
A7CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7CR8	1901-0096		DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A7CR9	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MP493
A7CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A7MP1	0403-0026	2	GLIDE:NYLON	28480	0403-0026
A7MP2	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A7MP3	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A7MP4	4040-0752	3	EXTRACTOR-PC BOARD YEL POLYC	28480	4040-0752
A7MP5	4040-0752		EXTRACTOR-PC BOARD YEL POLYC	28480	4040-0752
A7Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q2	1853-0281	10	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A7Q3	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A7Q4	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A7Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q7	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A7Q8	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A7Q9	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A7Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q11	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A7Q12	1853-0224	3	TRANSISTOR PNP SI TO-39 PD=1W FT=15MHZ	0192A	2N5415
A7Q13	1853-0224		TRANSISTOR PNP SI TO-39 PD=1W FT=15MHZ	0192A	2N5415
A7Q14	1853-0224		TRANSISTOR PNP SI TO-39 PD=1W FT=15MHZ	0192A	2N5415
A7Q15	1854-0234	3	TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	0192A	2N3440
A7Q16	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A7Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A7R1	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A7R2			NOT ASSIGNED		
A7R3	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A7R4	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R5	0757-0317	6	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A7R6	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A7R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R8	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R9	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R10	0698-3160	40	RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A7R11	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R12	0698-3457	14	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A7R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R14	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A7R15	0698-3154	8	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A7R16	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A7R17	2100-3274	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TRN	73138	72-146-0
A7R18	0757-0855	1	RESISTOR 68.1K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-6812-F
A7R19	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R20	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R21	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R22	0698-3161	4	RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A7R23	0698-3161		RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A7R24	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A7R25	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R26	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A7R27	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A7R28	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A7R29	0757-0467	11	RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A7R30	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R31	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A7R32	0698-3452	8	RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A7R33	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R34	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A7R35	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A7R36	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R37	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R38	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R39	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R40	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R41	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R42	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R43	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A7R44	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A7R45	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A7R46	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R47	0757-0854	1	RESISTOR 56.2K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-5622-F
A7R48	0698-3454	6	RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A7R49	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A7R50	0757-0459	6	RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A7R51	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R52	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R53	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A7R54	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A7R55	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R56	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A7R57	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A7R58	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A7R59	2100-3355	3	RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	73138	72-150-0
A7R60	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A7R61	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A7R62	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R63	2100-3355		RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	73138	72-150-0
A7R64	2100-3354	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	73138	72-149-0
A7R65	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A7R66	0698-3391	1	RESISTOR 21.5 1% .5W F TC=0+-100	0552D	CMF-65-2
A7R67	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R68	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A7R69	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A7R70	2100-3353	4	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	0374D	33A6X-Y46-203
A7R71	2100-3353		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	0374D	33A6X-Y46-203
A7U1	1820-1200	5	IC INV TTL LS HEX 1-INP	0169H	SN74LS05N
A7U2	1826-0119	2	IC	0291J	NE555T
A7U3	1820-1144		IC GATE TTL LS NOR QUAD 2-INP	0223G	9LS02PC
A7U4	1820-1200		IC INV TTL LS HEX 1-INP	0169H	SN74LS05N
A7U5	1826-0119		IC	0291J	NE555T
A7U6	1820-1197	3	IC GATE TTL LS NAND QUAD 2-INP	0169H	SN74LS00N
A7U7	1820-1144		IC GATE TTL LS NOR QUAD 2-INP	0223G	9LS02PC
A7VR1	1902-3193	1	DIODE-ZNR 13.3V 5% DO-7 PD=.4W TC=+.059%	0223G	FZ7272
A7VR2	1902-3268	1	DIODE-ZNR 20.1V 5% DO-7 PD=.4W TC=+.079%	0223G	FZ7300
A7VR3	1902-3002	2	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	0203G	BZ 10939-2
A8	08565-60095	1	ASSEMBLY, HIGH VOLTAGE	28480	08565-60095
A8C1	0160-0544	2	CAPACITOR-FXD .022UF +-20% 4KVDC	28480	0160-0544
A8C2	0160-0544		CAPACITOR-FXD .022UF +-20% 4KVDC	28480	0160-0544
A8C3	0160-0684	3	CAPACITOR-FXD 1000PF +-20% 4KVDC	28480	0160-0684
A8C4	0160-2264	3	CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A8C5	0160-0684		CAPACITOR-FXD 1000PF +-20% 4KVDC	28480	0160-0684
A8C6	0160-4051	2	CAPACITOR-FXD .01UF +-20% 4KVDC	28480	0160-4051
A8C7	0160-4051		CAPACITOR-FXD .01UF +-20% 4KVDC	28480	0160-4051
A8C8	0160-0684		CAPACITOR-FXD 1000PF +-20% 4KVDC	28480	0160-0684
A8C9	0180-0089	1	CAPACITOR-FXD 10UF+50-10% 150VDC AL	0420J	30D106F150DD2
A8CR1	1901-0683	1	DIODE-HV RECT 10KV 5MA 250NS	28480	1901-0683
A8CR2	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A8CR3	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A8CR4	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A8CR5	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A8MP1	0340-0007	2	STANDOFF-RND .5LG 6-32THD .500 CER GLZ	28480	0340-0007
A8MP2	0340-0007		STANDOFF-RND .5LG 6-32THD .500 CER GLZ	28480	0340-0007
A8MP3	01332-01201	1	BRACKET	28480	01332-01201
A8MP4	2360-0275	6	SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	04600	102222
A8MP5	2360-0275		SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	04600	102222

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8MP6	2360-0275		SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	0460D	10-222
A8MP7	2360-0275		SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	0460D	10-222
A8MP8	2360-0275		SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	0460D	10-222
A8MP9	2360-0275		SCREW-MACH 6-32 .25-IN-LG BDG-HD-SLT	0460D	10-222
A8R1	0684-1041	1	RESISTOR 100K 10% .25W FC TC=-400/+800	0160G	CB1041
A8R2	0757-0747	1	RESISTOR 5.11K 1% .25W F TC=0+-100	0341B	C5-1/4-T0-5111-F
A8R3	0687-3941	1	RESISTOR 390K 10% .5W CC TC=0+882	0160G	EB3941
A8R4	0698-8018	1	RESISTOR 30M 1% 3W CP TC=0+-100	03888	PVC175-3-T0-3004-F
A8R5	0683-1025	1	RESISTOR 1K 5% .25W FC TC=-400/+600	0160G	CB1025
A8R6	0684-6811	3	RESISTOR 680 10% .25W FC TC=-400/+600	0160G	CB6811
A8R7	0687-1061	1	RESISTOR 10M 10% .5W CC TC=0+1059	0160G	EB1061
A8R8	0684-6811		RESISTOR 680 10% .25W FC TC=-400/+600	0160G	CB6811
A8R9	0684-1051	1	RESISTOR 1M 10% .25W FC TC=-800/+900	0160G	CB1051
A8R10	0687-2221	1	RESISTOR 2.2K 10% .5W CC TC=0+647	0160G	EB2221
A8R11	0687-1001	1	RESISTOR 10 10% .5W CC TC=0+412	0160G	EB1001
A8R12			NOT ASSIGNED		
A8R13	2100-3359	1	RESISTOR-TRMR 2M 20% C SIDE-ADJ 1-TRN	73138	72-155-0
A8R14			NOT ASSIGNED		
A8R15	0684-6811		RESISTOR 680 10% .25W FC TC=-400/+600	0160G	CB6811
A8R16	0683-1015	1	RESISTOR 100 5% .25W FC TC=-400/+500	0160G	CB1015
A8R17	0687-5611	1	RESISTOR 560 10% .5W CC TC=0+529	0160G	EB5611
A8T1	01335-61101	1	TRANSFORMER	28480	01335-61101
A8V1	2140-0018	2	LAMP-GLOW A9A-C 90/58VDC 700UA T-2-BULB	74276	A9A-C
A8V2	2140-0018		LAMP-GLOW A9A-C 90/58VDC 700UA T-2-BULB	74276	A9A-C
A8VR1	1902-3333	2	DIODE-ZNR 46.4V 5% DO-7 PD=.4W TC=+.081%	0203G	BZ 10939-374
A9	08565-60054	1	ASSEMBLY, HIGH VOLTAGE OSCILLATOR	28480	08565-60054
A9C1	0180-0141	3	CAPACITOR-FXD 50UF+75-10% 50VDC AL	0420J	30D506G050DD2
A9C2	0180-0269	1	CAPACITOR-FXD 1UF+75-10% 150VDC AL	0420J	30D105G150BA2
A9C3	0160-4297	26	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M2232822-CDH
A9C4	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M2232822-CDH
A9C5	0160-0166	2	CAPACITOR-FXD .068UF +-10% 200VDC POLYE	0420J	292P68392
A9C6	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M2232822-CDH
A9C7	0160-0164	1	CAPACITOR-FXD .039UF +-10% 200VDC POLYE	0420J	292P39392
A9C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A9C9	0180-0141		CAPACITOR-FXD 50UF+75-10% 50VDC AL	0420J	30D506G050DD2
A9C10	0180-0141		CAPACITOR-FXD 50UF+75-10% 50VDC AL	0420J	30D506G050DD2
A9CR1	1901-0159	14	DIODE-PWR RECT 400V 750MA DO-41	0203G	SRI358-4
A9CR2	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SRI358-4
A9CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A9CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A9CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A9CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A9F1	2110-0001	2	FUSE 1A 250V FAST-BLO 1.25X.25 UL IEC	0470C	312001.
A9L1	9140-0171	2	COIL-MLD 40UH 10% Q=20 .296DX.968LG	28480	9140-0171
A9L2	9100-1641	10	COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A9L3	9140-0171		COIL-MLD 40UH 10% Q=20 .296DX.968LG	28480	9140-0171
A9MP1	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
A9MP2	08565-00038	1	HEAT SINK, HI-VOLTAGE	28480	08565-00038
A9MP3	2200-0111	2	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0111
A9MP4	2200-0111		SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0111
A9MP5	2260-0009	2	NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	28480	2260-0009
A9MP6	2260-0009		NUT-HEX-W/LKWR 4-40-THD .094-IN-THK	28480	2260-0009
A9MP7	1200-0081	20	INSULATOR-8SHG-FLG NYLON	28480	1200-0081
A9MP8	1200-0081		INSULATOR-8SHG-FLG NYLON	28480	1200-0081
A9MP9	2110-0269	16	FUSEHOLDER-CLIP TYPE .25D-FUSE	28480	2110-0269
A9MP10	2110-0269		FUSEHOLDER-CLIP TYPE .25D-FUSE	28480	2110-0269
A9MP11	1200-0043		INSULATOR-XSTR ALUMINUM	0473G	32-047
A9Q1	1854-0518	1	TRANSISTOR NPN 2N5877 SI TO-3 PD=150W	0203G	2N5877
A9Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A9Q3	1854-0361	1	TRANSISTOR NPN 2N4239 SI TO-5 PD=800MW	0203G	2N4239
A9R1	2100-3054	7	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	A9-R50K
A9R2	2100-3162	1	RESISTOR-TRMR 200K 10% C SIDE-ADJ 17-TRN	73138	A9-R200K
A9R3	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2151-F
A9R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1002-F
A9R5	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F
A9R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F
A9R7	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1473-F
A9R8	0698-3446	4	RESISTOR 383 1% .125W F TC=0+-100	0329B	C4-1/8-T0-383R-F
A9R9	0683-2265	1	RESISTOR 22M 5% .25W FC TC=-900/+1200	0160G	CB2265
A9R10	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	0329B	C4-1/8-T0-121R-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R11	0698-8913	1	RESISTOR 1.5M 1% .125W F TC=0+-100	28480	0698-8913
A9R12	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A9U1	1826-0167	1	IC OP AMP	0192A	CA3094AT
A9VR1	1902-3357	1	DIODE-ZNR 56.2V 5% DO-7 PD=.4W TC=+.081%	0203G	BZ 10939-398
A10	08565-60029	1	ASSEMBLY, DISPLAY MOTHERBOARD	28480	08565-60029
A10C1	0160-3879	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10E1	1251-0600	12	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A10E2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A10E3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A10E4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A10E5	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A10J1	1200-0507		SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A10R1	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A10R2	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A10R3	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A10R4	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A10R5	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A10R6	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A10R7	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A10VR1	1902-3381	1	DIODE-ZNR 68.1V 5% DO-7 PD=.4W TC=+.079%	0203G	BZ 10939-422
A10XA3	1251-0472	2	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	0450G	252-06-30-300
A10XA4	1251-2035	11	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A10XA5	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A10XA6	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A10XA7	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A10XA8	1251-2034	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	0450G	252-10-30-300
A10XA9	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A11	08565-60015	1	ASSEMBLY, DVM DIGITAL	28480	08565-60015
A11C1	0180-1746	20	CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A11C2	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A11C3	0180-2208	9	CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X9010B2
A11C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C6	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A11C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C10	0160-2307	3	CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A11C11	0160-2222	1	CAPACITOR-FXD 1500PF +-5% 300VDC	28480	0160-2222
A11C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A11C13	0160-0574	2	CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11C14	0160-0574		CAPACITOR-FXD .022UF +-20% 100VDC CER	28480	0160-0574
A11C15	0140-0200	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA 0+70	72136	DM15F391J0300WV1CR
A11C16	0160-0155	4	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	0420J	292P33292
A11C17	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A11CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A11CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A11E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A11J1	1200-0507		SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A11J2	1200-0507		SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A11L1	9100-2833	2	COIL 39UH 5% Q=70 .250X1LG SRF=20MHZ	28480	9100-2833
A11L2	9100-1619	13	COIL-MLD 6.8UH 10% Q=50 .1550X.375LG	02178	15-4435-2K
A11MP1	1480-0073		PINDRIVE 0.250" LG	28480	1480-0073
A11MP2	1480-0073		PINDRIVE 0.250" LG	28480	1480-0073
A11MP3	4040-0748	11	EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A11MP4	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A11Q1	1854-0477	12	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A
A11Q2	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A
A11Q3	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A
A11Q4	1854-0019	21	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A11Q5	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11R1	0698-3458	9	RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A11R2	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A11R3	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A11R4	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A11R5	0698-3243	11	RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A11R6	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A11R7	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A11R8	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A11R9	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A11R10	0757-0461	18	RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A11R11	0698-3161		RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A11R12	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A11R13	0698-0083	28	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A11R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A11R15	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A11R16	0757-0419	5	RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A11R17	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A11R18	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A11R19	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A11R20	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A11R21	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A11R22	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A11R23	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A11R24	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A11R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A11R26	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A11R27	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A11R28	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A11U1	1820-1740	4	IC DRVR MOS# DSPL DRVR	0340F	DS8863N
A11U2	1820-1443	4	IC CNTR TTL LS BIN ASYNCHRO	0169H	SN74LS293N
A11U3	1820-1443		IC CNTR TTL LS BIN ASYNCHRO	0169H	SN74LS293N
A11U4	1810-0208	10	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R68K
A11U5	1810-0204	4	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R1K
A11U6	1820-1688	1	IC DCDR TTL BCD-TO-7-SEG	0169H	SN74LS247N
A11U7	1858-0057	3	TRANSISTOR ARRAY 16-PIN PLSTC DIP	0192A	CA3082F
A11U8	1820-1200		IC INV TTL LS HEX 1-INP	0169H	SN74LS05N
A11U9	1820-1144		IC GATE TTL LS NOR QUAD 2-INP	0223G	9LS02PC
A11U10	1820-0586	1	IC INV TTL L HEX 1-INP	0340F	DM74L04N
A11U11	1810-0205	6	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A11U12	1810-0205		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A11U13	1820-0471	5	IC INV TTL HEX 1-INP	0223G	7406PC
A11U14	1820-1198	2	IC GATE TTL LS NAND QUAD 2-INP	0169H	SN74LS03N
A11U15	1820-1216	3	IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N
A11U16	1820-0798	1	IC CNTR MOS DECD	28480	1820-0798
A11U17	1820-1534	1	IC GATE CMOS NOR QUAD 2-INP	0203G	MC14001CL
A11U18	1820-0471		IC INV TTL HEX 1-INP	0223G	7406PC
A11U19	1820-1445	1	IC LCH TTL LS 4-BIT	0169H	SN74LS375N
A11U20	1820-1202	1	IC GATE TTL LS NAND TPL 3-INP	0223G	9LS10PC
A11U21	1820-1443		IC CNTR TTL LS BIN ASYNCHRO	0169H	SN74LS293N
A11U22	1820-1112	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169H	SN74LS74N
A11U23	1810-0205		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A11VR1	1902-0048	4	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	0223G	PZ7244
A11VR2	1902-3036	3	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	0203G	BZ 10939-38
A11Y1	0410-0467		CRYSTAL, 3.0 MHZ	28480	0410-0467
A12	08565-60016	1	ASSEMBLY, DVM ANALOG	28480	08565-60016
A12C1	0160-2204	4	CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A12C2	0160-2207	7	CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A12C3	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A12C4	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A12C5	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A12C6	0160-2199	5	CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A12C7	0160-2204		CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A12C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A12C9	5080-9047	1	CAPACITOR	28480	5080-9047
A12C10	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A12C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A12C12	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A12C13	0160-0575	1	CAPACITOR-FXD .047UF +-20% 50VDC CER	28480	0160-0575
A12C14	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A12C15	0180-2182	2	CAPACITOR-FXD 18UF+-10% 50VDC TA	0420J	150D186X9050R2

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12C16	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0140-2199
A12C17	0170-0066	2	CAPACITOR-FXD .027UF +-10% 200VDC POLYE	0420J	292P27392
A12C18	0170-0066		CAPACITOR-FXD .027UF +-10% 200VDC POLYE	0420J	292P27392
A12C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A12C20	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0140-4084
A12C21	0160-3501	1	CAPACITOR-FXD 4UF +-10% 50VDC MET-POLYC	28480	0140-3501
A12C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A12CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR5	1901-0376	4	DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A12CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR8	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A12CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12CR10	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A12CR11	1901-0586	1	DIODE-GEN PRP 30V 25MA TO-72	28480	1901-0586
A12CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A12E1	0340-0060	18	TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E2	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E3	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E4	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E5	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E6	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E7	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12E8	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A12L1	9140-0129	2	COIL-MLD 220UH 5% Q=65 .155DX.375LG	02178	15-1315-20J
A12L2	9140-0129		COIL-MLD 220UH 5% Q=65 .155DX.375LG	02178	15-1315-20J
A12MP1	1480-0073		PIN,DRIVE 0.250" LG	28480	1480-0073
A12MP2	1480-0073		PIN,DRIVE 0.250" LG	28480	1480-0073
A12MP3	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A12MP4	4040-0749	3	EXTRACTOR-PC BOARD BRN POLYC	28480	4040-0749
A12Q1	1854-0023	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A12Q2	1853-0034	13	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A12Q3	1855-0093	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0093
A12Q4	1855-0412	2	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A12Q5	1855-0308	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0308
A12Q6	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A12Q7	1855-0412		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0412
A12Q8	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A12Q9	1855-0418	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0418
A12Q10	1855-0305	4	TRANSISTOR J-FET 2N4117A N-CHAN D-MODE	0288C	2N4117A
A12Q11	1855-0305		TRANSISTOR J-FET 2N4117A N-CHAN D-MODE	0288C	2N4117A
A12Q12	1855-0305		TRANSISTOR J-FET 2N4117A N-CHAN D-MODE	0288C	2N4117A
A12Q13	1855-0305		TRANSISTOR J-FET 2N4117A N-CHAN D-MODE	0288C	2N4117A
A12Q14	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A12Q15	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A12Q16	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A12Q17	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A12R1	0698-8829	3	RESISTOR 20K .1% .125W F TC=0+-10	28480	0698-8829
A12R2	0698-8839	1	RESISTOR 2,2222K .1% .125W F TC=0+-10	28480	0698-8839
A12R3	0683-5645	1	RESISTOR 560K 5% .25W FC TC=-800/+900	0160G	C8S645
A12R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-TC-1002-F
A12R5	0698-0085	17	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A12R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R7	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A12R8	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R9	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A12R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R11	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A12R12	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A12R13	0698-3558	3	RESISTOR 4.02K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4021-F
A12R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A12R15	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R16	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A12R17	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R18	2100-3353		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	03740	33A6X-Y46-203
A12R19	0698-8829		RESISTOR 20K .1% .125W F TC=0+-10	28480	0698-8829
A12R20	0698-3157	21	RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A12R21	0698-8840	1	RESISTOR 2.1885K .1% .125W F TC=0+-10	0227C	MAR6
A12R22	0698-3430	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-2150-F
A12R23	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R24	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A12R25	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12R26	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A12R27	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A12R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R29	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A12R30	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A12R31	0757-0449	6	RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A12R32	0757-0459		RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A12R33	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A12R34	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A12R35	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R36	0698-3558		RESISTOR 4.02K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4021-F
A12R37	2100-3212	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	72-103-0
A12R38	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R39	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R40	0698-3558		RESISTOR 4.02K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4021-F
A12R41	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A12R42	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A12R43	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A12R44	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A12R45	0698-3432	1	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A12R46	0698-3132	7	RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A12R47	0757-0288	8	RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-9091-F
A12R48	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A12R49	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A12R50	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A12R51	0698-3443	2	RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A12R52	0757-0428	8	RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A12R53	2100-3207		RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	72-145-0
A12R54	0698-3159	4	RESISTOR 26.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2612-F
A12R55	0698-3445	4	RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A12R56	2100-3353		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	0374D	33A6X-Y46-203
A12R57	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A12R58	0757-0459		RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A1281	3101-1274	4	SWITCH-SL SPDT-NS SUBMIN 2A 120VAC PC	10389	23-021-008
A12U1	1820-0223	4	IC 301 OP AMP	0379D	LM301A
A12U2	1820-0223		IC 301 OP AMP	0379D	LM301A
A12U3	1826-0009	1	IC 725 OP AMP	0223G	725MC
A12U4	1820-0223		IC 301 OP AMP	0379D	LM301A
A12U5	1820-0321	1	IC 710 COMPARATOR	0223G	710MC
A12U6	1820-1211	1	IC GATE TTL LS EXCL-OR QUAD 2-INP	0169M	SN74LS86N
A12U7	1820-1197		IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74LS00N
A12U8	1820-1195	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS175A
A12U9	1820-1197		IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74LS00N
A12VR1	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	0203G	SZ 10939-98
A12VR2	1902-0025	9	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A12VR3	1902-3036		DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	0203G	SZ 10939-38
A13	08565-60017	1	ASSEMBLY, RELAY DRIVER	28480	08565-60017
A13CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR4	1901-0539	3	DIODE-SCHOTTKY	28480	1901-0539
A13CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR18	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A13CR19	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR20	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR21	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A13CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR23	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A13CR24	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A13CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13MP1	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A13MP2	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A13MP3	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A13MP4	4040-0750		EXTRACTOR-PC BOARD RED POLYC	28480	4040-0750
A13Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A13Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A13Q8	1854-0637	5	TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	28480	1854-0637
A13Q9	1854-0637		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	28480	1854-0637
A13Q10	1854-0637		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	28480	1854-0637
A13R1	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A13R2	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R3	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R4	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A13R5	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A13R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R7	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R8	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A13R9	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R10	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R11	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R12	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R13	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R15	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A13R16	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A13R17	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13R18	0757-0159	1	RESISTOR 1K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1R0-F
A13R19	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A13U1	1820-1112		IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169H	SN74LS74N
A14	08565-60018	1	ASSEMBLY, TUNING STABILIZER CONTROL	28480	08565-60018
A14C1	0180-1743	8	CAPACITOR-FXD .1UF+-10% 35VDC TA	0420J	150D104X9035A2
A14C2	0180-0291	8	CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A14C3	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	0420J	150D104X9035A2
A14C4	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	0420J	150D104X9035A2
A14C5	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	0420J	150D104X9035A2
A14C6	0160-3875	9	CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C7	0160-0158	1	CAPACITOR-FXD 5600PF +-10% 200VDC POLYE	0420J	292P56292
A14C8	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A14C9	0160-3877	8	CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A14C10	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C11	0160-3473	1	CAPACITOR-FXD .039UF +-5% 100VDC	01884	AP941B393J
A14C12	0160-0162	2	CAPACITOR-FXD .022UF +-10% 200VDC POLYE	0420J	292P22392
A14C13	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C14	0160-0157	1	CAPACITOR-FXD 4700PF +-10% 200VDC POLYE	0420J	292P47292
A14C15	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A14C16	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C17	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C18	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A14C19	0160-3451	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-3451
A14C20	0180-1731	10	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A14C21	0180-2249	2	CAPACITOR-FXD 47UF+-10% 20VDC TA	0420J	150D476X9020B2
A14C22	0180-2249		CAPACITOR-FXD 47UF+-10% 20VDC TA	0420J	150D476X9020B2
A14C23	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A14CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A14E1	0340-0037	1	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14K1	0490-0782	1	RELAY-REED 1A 100MA 250VAC 9VDC-COIL 3VA	28480	0490-0782
A14MP1	0340-0039	5	TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A14MP2	1480-0073		PINDRIVE 0.250" LG	28480	1480-0073
A14MP3	1480-0073		PINDRIVE 0.250" LG	28480	1480-0073
A14MP4	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A14MP5	4040-0751		EXTRACTOR-PC BOARD ORN POLYC	28480	4040-0751
A14Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q2	1853-0314	2	TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	0203G	2N2905A
A14Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q12	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q16	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q17	1854-0637		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	28480	1854-0637
A14Q18	1853-0314		TRANSISTOR PNP 2N2905A SI TO-39 PD=600MW	0203G	2N2905A
A14Q19	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A14Q20	1855-0098	1	TRANSISTOR P-CHAN E-MODE TO-72 SI	28480	1855-0098
A14Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A14Q22	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A14Q23	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A14R1	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R2	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R3	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R4	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R5	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R6	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R7	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R8	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R9	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R10	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R11	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R12	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R13	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R14	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R15	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R16	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R17	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R18	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R19	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R20	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R21	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R22	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R23	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6A11-F
A14R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R25	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R26	0757-0464	2	RESISTOR 90.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-9092-F
A14R27	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R28	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R29	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R30	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A14R31	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A14R32	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R33	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A14R34	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R35	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R36	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A14R37	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A14R38	0698-3136	7	RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A14R39	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A14R40	0698-4002	1	RESISTOR 5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5001-F
A14R41	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A14R42	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R43	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A14R44	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R45	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14R46	0698-3449	4	RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
A14R47	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A14R48	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A14R49	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A14R50	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R51	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A14R52	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A14R53	0683-1555	1	RESISTOR 1.5M 5% .25W FC TC=-900/+1100	0160G	CB1555
A14R54	0757-0446	1	RESISTOR 15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1502-F
A14R55	0698-3459	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A14R56	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A14R57	2100-1739	3	RESISTOR-TRMR 5K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-502
A14R58	0757-0274	7	RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A14R59	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A14R60	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A14R61	0757-0466	1	RESISTOR 110K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1103-F
A14R62	0757-0422	9	RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A14R63	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R64	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A14R65	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A14R66	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R67	0757-0123	6	RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A14R68	2100-1972	32	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A14R69	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A14R70	0698-4008	1	RESISTOR 40K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4002-F
A14R71	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A14R72	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A14R73	0698-6901	1	RESISTOR 32.8K .5% .125W F TC=0+-50	28480	0698-6901
A14R74	0698-8805	1	RESISTOR 10.35K .1% .125W F TC=0+-25	28480	0698-8805
A14R75	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A14R76	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-9091-F
A14R77	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R78	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R79	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A14R80	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A14R81	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A14R82	0698-3624	1	RESISTOR 150 5% 2W MO TC=0+-200	03418	FP-42
A14R83	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A14R84	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A14R85	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A14R86	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A14R87	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A14R88	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A14R89	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A14U1	1826-0261	38	IC 741 OP AMP	28480	1826-0261
A14U2	1826-0261		IC 741 OP AMP	28480	1826-0261
A14U3	1826-0092	21	IC OP AMP	28480	1826-0092
A14U4	1826-0261		IC 741 OP AMP	28480	1826-0261
A14U5	1826-0261		IC 741 OP AMP	28480	1826-0261
A14U6	1826-0261		IC 741 OP AMP	28480	1826-0261
A14U7	1826-0261		IC 741 OP AMP	28480	1826-0261
A14U8	1826-0261		IC 741 OP AMP	28480	1826-0261
A15	08565-60032	1	ASSEMBLY, SWEEP ATTENUATOR	28480	08565-60032
A15C1	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A15C2	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A15C3	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A15C4	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A15C8	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A15CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A15CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15CR18	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A15L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A15L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A15MP1	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A15MP2	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A15MP3	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A15MP4	4040-0752		EXTRACTOR-PC BOARD YEL POLYC	28480	4040-0752
A15Q1	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A15Q2	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A15Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q7	1854-0557	2	TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	0169H	2N2432A
A15Q8	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A15Q9	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A15Q10	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A15Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q15	1854-0557		TRANSISTOR NPN 2N2432A SI TO-18 PD=300MW	0169H	2N2432A
A15Q16	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A15Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q23	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q25	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15Q27	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A15R1	0698-6630	33	RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R2	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R3	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R4	0698-3451	3	RESISTOR 133K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1333-F
A15R5	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R7	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R8	0698-8847	2	RESISTOR 66.5K .25% .125W F TC=0+-100	28480	0698-8847
A15R9	0698-8861	2	RESISTOR 6.66K .1% .125W F TC=0+-25	28480	0698-8861
A15R10	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R11	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R12	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A15R13	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R15	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R16	0698-8847		RESISTOR 66.5K .25% .125W F TC=0+-100	28480	0698-8847
A15R17	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R18	0698-6353	2	RESISTOR 50K .1% .125W F TC=0+-25	0552D	CMF-55-1, T-9
A15R19	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R21	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R22	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R23	0698-6624	1	RESISTOR 2K .1% .125W F TC=0+-25	28480	0698-6624
A15R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A15R25	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R26	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R27	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R28	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R29	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R30	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R31	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R32	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R33	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R34	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R35	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A15R36	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R37	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R38	0698-8852	1	RESISTOR 28.6K .25% .125W F TC=0+-100	28480	0698-8852
A15R39	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R40	0698-6377	1	RESISTOR 200 .1% .125W F TC=0+-25	28480	0698-6377

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A15R41	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A15R42	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R43	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R44	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R45	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R46	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A15R47	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A15R48	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R49	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R50	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R51	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R52	0698-3194	7	RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A15R53	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3006P-1-203
A15R54	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A15R55	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A15R56	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R57	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A15R58	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R59	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R60	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R61	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15R62	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A15R63	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A15U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A15U2	1826-0261		IC 741 OP AMP	28480	1826-0261
A15U3	1826-0261		IC 741 OP AMP	28480	1826-0261
A15U4	1826-0261		IC 741 OP AMP	28480	1826-0261
A15U5	1826-0261		IC 741 OP AMP	28480	1826-0261
A15VR1	1902-3104	4	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	02036	SZ 10939-110
A15VR2	1902-3104		DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	02036	SZ 10939-110
A15VR3	1902-3104		DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	02036	SZ 10939-110
A15VR4	1902-3059	1	DIODE-ZNR 3.83V 5% DO-7 PD=.4W TC=-.051%	02036	SZ 10939-62
A16	08565-60019	1	ASSEMBLY, SWEEP GENERATOR	28480	08565-60019
A16C1	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16C2	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A16C3	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A16C4	0160-2257	5	CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A16C5	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A16C6	0160-2150	3	CAPACITOR-FXD 33PF +-5% 300VDC	28480	0160-2150
A16C7	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A16C8	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16C9	0160-2307		CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A16C10	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A16C11	0180-1735	2	CAPACITOR-FXD .22UF+-10% 35VDC TA	0420J	150D224X9035A2
A16C12	0160-3009	1	CAPACITOR-FXD 982PF +-1% 100VDC MICA0+70	28480	0160-3009
A16C13	0160-3402	1	CAPACITOR-FXD 1UF +-5% 50VDC MET-POLYC	28480	0160-3402
A16C14	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16C15	0160-0166		CAPACITOR-FXD .068UF +-10% 200VDC POLYE	0420J	292P68392
A16C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A16C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A16C20	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A16C21	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A16C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A16C23	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A16C24	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16C25	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16C26	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A16CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR3	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A16CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A16CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR18	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR19	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR20	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR21	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR23	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR24	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR26	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR27	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR28	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR29	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16CR30	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A16L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A16L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A16L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A16MP1	1205-0202	1	THERMAL LINK DUAL TO-18-PKG	28480	1205-0202
A16MP2	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A16MP3	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A16MP4	4040-0753	1	EXTRACTOR-PC BOARD GRN POLYC	28480	4040-0753
A16MP5	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A16Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q2	1855-0417	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0417
A16Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q6	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A16Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q8	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A16Q9	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A16Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q11	1853-0316	1	TRANSISTOR-DUAL PNP PD=500MW	28480	1853-0316
A16Q12	1855-0082	5	TRANSISTOR MOSFET P-CHAN D-MODE SI	28480	1855-0082
A16Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q16	1855-0082		TRANSISTOR MOSFET P-CHAN D-MODE SI	28480	1855-0082
A16Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q19	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A16Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q23	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q25	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q27	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q28	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q29	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q30	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q31	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16Q32	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A16R1	0698-3451		RESISTOR 133K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1333-F
A16R2	0698-8848	1	RESISTOR 57.2K .25% .125W F TC=0+-100	28480	0698-8848
A16R3	0698-7421	4	RESISTOR 40K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-4002-C
A16R4	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A16R5	0698-7797	1	RESISTOR 7.68K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-7681-C
A16R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R8	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A16R9	2100-2852	1	RESISTOR-TRMR 1K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-102
A16R10	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A16R11	0757-0459		RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A16R12	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A16R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R14	0757-0289	14	RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-1332-F
A16R15	2100-2851	5	RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-202
A16R16	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A16R17	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A16R18	0698-3442	8	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A16R19	2100-1702	1	RESISTOR-TRMR 100 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-101
A16R20	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A16R21	0698-4482	3	RESISTOR 17.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1742-F
A16R22	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R23	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A16R24	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A16R25	2100-2851		RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-202
A16R26	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R27	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A16R28	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R29	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	CC
A16R30	0757-0443	7	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A16R31	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A16R32	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A16R33	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R34	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R35	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R36	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R37	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R38	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R39	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R40	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R41	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R42			NOT ASSIGNED		
A16R43	0698-7288	10	RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R44	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R45	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R46	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R47	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A16R48	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R49	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R50	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R51	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R52	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R53	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A16R54	0698-7288		RESISTOR 147K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1473-G
A16R55	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A16R56	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A16R57	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A16R58	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A16R59	0698-6360	6	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R60	0698-8849	1	RESISTOR 45.3K .1% .125W F	28480	0698-8849
A16R61	0698-6360		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R62	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A16R63	0683-3355	2	RESISTOR 3.3M 5% .25W FC TC=-900/+1100	0160G	CB3355
A16R64	0683-3355		RESISTOR 3.3M 5% .25W FC TC=-900/+1100	0160G	CB3355
A16R65	0698-6360		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R66	0698-8862	1	RESISTOR 5.8K .1% .125W F TC=0+-25	28480	0698-8862
A16R67	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R68	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R69	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3160
A16R70	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R71	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R72	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A16R73	0683-6845	1	RESISTOR 680K 5% .25W FC TC=-800/+900	0160G	CB6845
A16R74	2100-1973	1	RESISTOR-TRMR 200 10% WW TOP-ADJ 20-TRN	03740	3005P-1-201
A16R75	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A16R76	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R77	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A16R78	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R79	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R80			NOT ASSIGNED		
A16R81	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A16R82	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R83	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A16R84	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R85	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A16R86	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A16R87	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R88	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A16R89	0698-3159		RESISTOR 26.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2612-F
A16R90	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A16R91	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A16R92	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A16R93 THRU					
A16R95			NOT ASSIGNED		
A16R96	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A16R97	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5112-F
A16R98	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F
A16R99	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F
A16R100	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1002-F
A16R101	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A16R102	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R103	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R104	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A16R105	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R106	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R107	0698-6360		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A16R108	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R109	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R110	0698-8861		RESISTOR 6.66K .1% .125W F TC=0+-25	28480	0698-8861
A16R111	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R112	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R113	0698-3237	3	RESISTOR 5K .25% .125W F TC=0+-50	28480	0698-3237
A16R114	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R115	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R116	0698-8172	1	RESISTOR 4K .25% .125W F TC=0+-50	0299E	MFAC1/8-T2-4001-C
A16R117	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R118	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A16R119	0698-8868	1	RESISTOR 2.215K .25% .125W F TC=0+-100	28480	0698-8868
A16R120			NOT ASSIGNED		
A16R121	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1472-F
A16R122	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A16R123	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A16R124	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A16R125	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A16R126	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1002-F
A16R127	0698-3167	2	RESISTOR 25K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2502-F
A16R128	0757-0462	3	RESISTOR 75K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-7502-F
A16R129	0757-0462		RESISTOR 75K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-7502-F
A16R130	0698-3167		RESISTOR 25K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2502-F
A16U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A16U2	1826-0092		IC OP AMP	28480	1826-0092
A16U3	1820-0223		IC 301 OP AMP	0379D	LM301A
A16U4	1826-0026	1	IC COMPARATOR	0340F	LM311H
A16U5	1820-1550	2	IC GATE CMOS OR QUAD 2-INP	0203G	MC140718CL
A16U6	1820-1551	2	IC GATE CMOS AND QUAD 2-INP	0203G	MC140818CL
A16U7	1820-1551		IC GATE CMOS AND QUAD 2-INP	0203G	MC140818CL
A16U8	1820-1592	1	IC INV CMOS HEX 1-INP	0203G	MC140698CL
A16U9	1826-0092		IC OP AMP	28480	1826-0092
A16U10	1810-0208		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R68K
A16VR1	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A16VR2	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	0203G	BZ 10939-98
A16VR3	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A16VR4	1902-3171	10	DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A16VR5	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A16VR6	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A16VR7	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A16VR8	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A16VR9	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A17	08565-60020	1	ASSEMBLY, FREQUENCY CONTROL	28480	08565-60020
A17C1	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A17C2	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C3	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C4	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C5	0180-0116	3	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	0420J	150D685X9035B2
A17C6	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C7	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C8	0160-3877		CAPACITOR-FXD 100PF +-20% 200VDC CER	28480	0160-3877
A17C9	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A17C10	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A17C11	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A17C12	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A17C13	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A17C14	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A17C15	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A17C16	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A17CR1 THRU A17CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15.1315-12J
A17L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15.1315-12J
A17L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15.1315-12J
A17L4	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15.1315-12J
A17MP1	1480-0073		PIN,DRIVE 0.250" LG	28480	1480-0073
A17MP2	1480-0073		PIN,DRIVE 0.250" LG	28480	1480-0073
A17MP3	4040-0754	1	EXTRACTOR-PC BOARD BLU POLYC	28480	4040-0754
A17MP4	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A17Q1	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q2	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q3	1855-0082		TRANSISTOR MOSFET P-CHAN D-MODE SI	28480	1855-0082
A17Q4	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q5	1855-0082		TRANSISTOR MOSFET P-CHAN D-MODE SI	28480	1855-0082
A17Q6	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q7	1855-0082		TRANSISTOR MOSFET P-CHAN D-MODE SI	28480	1855-0082
A17Q8	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q10	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q12	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q14	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q16	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q18	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q20	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q23	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q25	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q27	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q28	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q29	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q30	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q31	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q32	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q33	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17Q34	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q35	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02103	2N3251
A17Q36	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q37	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A17Q38	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A17R1	0698-8832	1	RESISTOR 12.3K .1% .125W F TC=0+-10	28480	0698-8832
A17R2	0698-8833	7	RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A17R3	0698-3453	3	RESISTOR 196K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1963-F
A17R4	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A17R5	0698-8807	1	RESISTOR 39K .1% .125W F TC=0+-25	28480	0698-8807
A17R6	0698-0083		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A17R7	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A17R8	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A17R9*	0698-3158	5	RESISTOR 23.7K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-2372-F
A17R10	0698-8838	1	RESISTOR 3.52K .1% .125W F TC=0+-10	28480	0698-8838
A17R11	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A17R12	0757-0394	4	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A17R13	0698-8835	4	RESISTOR 5K .1% .125W F TC=0+-10	28480	0698-8835
A17R14	0698-8885	10	RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R15	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R16	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A17R17	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R18	0698-6248	2	RESISTOR 400K 1% .125W F TC=0+-100	28480	0698-6248
A17R19	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R20	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A17R21	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R22	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A17R23	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R24	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R25	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R26	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A17R27	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A17R28	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R29	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17R30	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A17R31	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R32	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A17R33	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A17R34	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R35	0698-8845	2	RESISTOR 124.46K .1% .125W F TC=0+-25	28480	0698-8845
A17R36	0698-8886	3	RESISTOR 4K .01% .125W F TC=0+-10	28480	0698-8886
A17R37	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R38	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R39	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R40	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R41	0698-8844	2	RESISTOR 248.9K .1% .125W F TC=0+-25	28480	0698-8844
A17R42	0683-6855	4	RESISTOR 6.8M 5% .25W FC TC=-900/+1100	0160G	C8A855
A17R43	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A17R44	0698-8887	2	RESISTOR 8K .01% .125W F TC=0+-10	28480	0698-8887
A17R45	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R46	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R47	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R48	0698-8843	2	RESISTOR 373.4K .1% .125W F TC=0+-25	28480	0698-8843
A17R49	0683-6855		RESISTOR 6.8M 5% .25W FC TC=-900/+1100	0160G	C8A855
A17R50	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A17R51	0698-8888	2	RESISTOR 12K .01% .125W F TC=0+-10	0227C	MAB6
A17R52	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R53	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R54	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R55	0698-8842	2	RESISTOR 497.8K .1% .125W F TC=0+-25	28480	0698-8842
A17R56	0683-6855		RESISTOR 6.8M 5% .25W FC TC=-900/+1100	0160G	C8A855
A17R57	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A17R58	0698-8889	2	RESISTOR 16K .01% .125W F TC=0+-10	28480	0698-8889
A17R59	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R60	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R61	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R62	0698-8841	2	RESISTOR 622.3K .1% .125W F TC=0+-25	28480	0698-8841
A17R63	0683-6855		RESISTOR 6.8M 5% .25W FC TC=-900/+1100	0160G	C8A855
A17R64	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A17R65	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R66	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R67	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R68	0698-6248		RESISTOR 400K 1% .125W F TC=0+-100	28480	0698-6248
A17R69	0757-0200	6	RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A17R70	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R71	0698-8890	1	RESISTOR 19.512K .01% .125W F TC=0+-10	28480	0698-8890
A17R72	0698-8886		RESISTOR 4K .01% .125W F TC=0+-10	28480	0698-8886
A17R73	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R74	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R75	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R76	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R77	0698-8845		RESISTOR 124.46K .1% .125W F TC=0+-25	28480	0698-8845
A17R78	0698-8886		RESISTOR 4K .01% .125W F TC=0+-10	28480	0698-8886
A17R79	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R80	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R81	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R82	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R83	0698-8844		RESISTOR 248.9K .1% .125W F TC=0+-25	28480	0698-8844
A17R84	0698-8887		RESISTOR 8K .01% .125W F TC=0+-10	28480	0698-8887
A17R85	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R86	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R87	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R88	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R89	0698-8843		RESISTOR 373.4K .1% .125W F TC=0+-25	28480	0698-8843
A17R90	0698-8888		RESISTOR 12K .01% .125W F TC=0+-10	28480	0698-8888
A17R91	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R92	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R93	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R94	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R95	0698-8842		RESISTOR 497.8K .1% .125W F TC=0+-25	28480	0698-8842
A17R96	0698-8889		RESISTOR 16K .01% .125W F TC=0+-10	28480	0698-8889
A17R97	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R98	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R99	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R100	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R101	0698-8841		RESISTOR 622.3K .1% .125W F TC=0+-25	28480	0698-8841
A17R102	0698-8885		RESISTOR 20K .01% .125W F TC=0+-10	28480	0698-8885
A17R103	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R104	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17R105	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R106	0698-8846	1	RESISTOR 83.33K .1% .125W F TC=0+-25	28480	0698-8846
A17R107	0698-4543	2	RESISTOR 487K 1% .125W F TC=0+-100	28480	0698-4543
A17R108	0698-6360		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A17R109	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R110	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R111	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R112	0698-6353		RESISTOR 50K .1% .125W F TC=0+-25	0552D	CMF-55-1, T-9
A17R113	0698-4543		RESISTOR 487K 1% .125W F TC=0+-100	28480	0698-4543
A17R114	0698-6360		RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
A17R115	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R116	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R117	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R118	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A17R119	0698-8877	1	RESISTOR 22.1K .1% .125W F	28480	0698-8877
A17R120	0698-8806	1	RESISTOR 33.5K .1% .125W F TC=0+-25	28480	0698-8806
A17R121	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A17R122	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R123	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A17R124	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A17R125	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A17R126	0698-3438	7	RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A17R127	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A17R128	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A17U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U2	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U3	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U4	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U5	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U6	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U7	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U8	1826-0261		IC 741 OP AMP	28480	1826-0261
A17U9	1826-0261		IC 741 OP AMP	28480	1826-0261
A17VR1	1902-0680	2	DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	0199A	1NR27
A17VR2	1902-3002		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	0203G	BZ 10939-2
A17VR3	1902-3182	8	DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268
A17VR4	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A17VR5	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268
A17VR6	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	0203G	BZ 10939-98
A18	08565-60021	1	ASSEMBLY, FULL MULTI-BAND	28480	08565-60021
A18C1	0160-0302	4	CAPACITOR-FXD .018UF +-10% 200VDC POLYE	0420J	293P18392
A18C2	0160-0302		CAPACITOR-FXD .018UF +-10% 200VDC POLYE	0420J	293P18392
A18C3	0160-0302		CAPACITOR-FXD .018UF +-10% 200VDC POLYE	0420J	293P18392
A18C4	0160-0302		CAPACITOR-FXD .018UF +-10% 200VDC POLYE	0420J	293P18392
A18C5	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X905082
A18C6	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A18C7	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A18C8	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X905082
A18CR1 THRU A18CR43	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A18L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A18L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A18L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A18L4	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A18MP1	1480-0073		PIN;DRIVE 0.250" LG	28480	1480-0073
A18MP2	1480-0073		PIN;DRIVE 0.250" LG	28480	1480-0073
A18MP3	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A18MP4	4040-0755	1	EXTRACTOR-PC BOARD VIO POLYC	28480	4040-0755
A18Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q7	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q9	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q11	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q13	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q15	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A18Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q22	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q23	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q24	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q25	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q26	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A18Q27	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q28	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q29	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q30	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q31	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q32	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q33	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q34	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q35	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18Q36	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q37	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A18Q38	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A18R1	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R2	0698-8851	1	RESISTOR, 34.7K ,1% ,125W F	28480	0698-8851
A18R3	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R4	0698-8850	1	RESISTOR 41.9K ,1% ,125W F	28480	0698-8850
A18R5	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R6	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R7	0698-8867	1	RESISTOR, 4.06K ,1% ,125W F	28480	0698-8867
A18R8	0698-8863	1	RESISTOR 5.2K ,1% ,125W F TC=0+-25	28480	0698-8863
A18R9	0698-8864	1	RESISTOR, 4.49K ,1% ,125W F	28480	0698-8864
A18R10	0698-8865	1	RESISTOR, 4.45K ,1% ,125W F	28480	0698-8865
A18R11	0698-8866	1	RESISTOR, 4.1K ,1% ,125W F		
A18R12	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R13	0757-0439		RESISTOR 6.81K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A18R14	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R15	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R16	0757-0439		RESISTOR 6.81K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A18R17	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R18	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R19	0757-0439		RESISTOR 6.81K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A18R20	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R21	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R22	0757-0439		RESISTOR 6.81K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A18R23	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R24	0757-0439		RESISTOR 6.81K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A18R25	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R26	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R27	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R28	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R29	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R30	0757-0440		RESISTOR 7.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A18R31	0698-3260		RESISTOR 464K 1% ,125W F TC=0+-100	28480	0698-3260
A18R32	0757-0458		RESISTOR 51.1K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A18R33	0698-3260		RESISTOR 464K 1% ,125W F TC=0+-100	28480	0698-3260
A18R34	0757-0458		RESISTOR 51.1K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A18R35	0698-3260		RESISTOR 464K 1% ,125W F TC=0+-100	28480	0698-3260
A18R36	0757-0458		RESISTOR 51.1K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A18R37	0698-3260		RESISTOR 464K 1% ,125W F TC=0+-100	28480	0698-3260
A18R38	0757-0458		RESISTOR 51.1K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A18R39	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R40	0698-0083		RESISTOR 1.96K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A18R41	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R42	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R43	0698-3456	3	RESISTOR 287K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2873-F
A18R44	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R45	0757-0465		RESISTOR 100K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R46	0698-8046	1	RESISTOR 16K ,1% ,125W F TC=0+-25	0299E	MF4C1/8-T9-1602-B
A18R47	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R48	0698-3456		RESISTOR 287K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2873-F
A18R49	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R50	0757-0465		RESISTOR 100K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R51	0698-8859	1	RESISTOR 12K ,1% ,125W F TC=0+-25	28480	0698-8859
A18R52	0698-6630		RESISTOR 20K ,1% ,125W F TC=0+-25	28480	0698-6630
A18R53	0757-0136	1	RESISTOR 619K 1% ,5W F TC=0+-100	0299E	MF7C1/2-T0-6193-F
A18R54	0757-0199		RESISTOR 21.5K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R55	0757-0465		RESISTOR 100K 1% ,125W F TC=0+-100	03298	C4-1/8-T0-1003-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A18R56	0698-6361	1	RESISTOR 8K .1% .125W F TC=0+-25	28480	0698-6361
A18R57	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R58	0698-3456		RESISTOR 287K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2873-F
A18R59	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R60	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R61	0698-6322	1	RESISTOR 4K .1% .125W F TC=0+-25	28480	0698-6322
A18R62	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R63	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A18R64	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R65	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R66	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R67	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R68	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A18R69	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R70	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R71	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R72	0757-0462		RESISTOR 75K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7502-F
A18R73	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R74	0757-0459		RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A18R75	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R76	0698-3161		RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A18R77	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R78	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A18R79	0698-8853	1	RESISTOR, 21.98K .1% .125W F	28480	0698-8853
A18R80	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R81	0698-8856	1	RESISTOR 13.56K .1% .125W F TC=0+-25	28480	0698-8856
A18R82	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R83	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R84	0698-8855	1	RESISTOR, 16.46K .1% .125W F	28480	0698-8855
A18R85	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R86	0698-8858	1	RESISTOR 12.4K .1% .125W F TC=0+-25	28480	0698-8858
A18R87	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R88	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R89	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R90	0698-8854	1	RESISTOR, 17.17K .1% .125W F	28480	0698-8854
A18R91	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R92	0698-8857	1	RESISTOR 12.56K .1% .125W F TC=0+-25	28480	0698-8857
A18R93	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R94	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R95	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A18R96	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R97	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R98	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R99	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R100	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R101	0683-1055	3	RESISTOR 1M 5% .25W FC TC=-800/+900	01607	CB1055
A18R102	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R103	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R104	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A18R105	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A18R106	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R107	0698-6630		RESISTOR 20K .1% .125W F TC=0+-25	28480	0698-6630
A18R108	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R109	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01607	CB1055
A18R110	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R111	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A18R112	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A18R113	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A18U1	1826-0092		IC OP AMP	28480	1826-0092
A18U2	1826-0092		IC OP AMP	28480	1826-0092
A18U3	1826-0092		IC OP AMP	28480	1826-0092
A18U4	1826-0092		IC OP AMP	28480	1826-0092
A18U5	1826-0092		IC OP AMP	28480	1826-0092
A18U6	1826-0092		IC OP AMP	28480	1826-0092
A18U7	1826-0092		IC OP AMP	28480	1826-0092
A18U8	1826-0092		IC OP AMP	28480	1826-0092
A18VR1	1902-0064	3	DIODE-ZNR 7.5V 5% DO-7 PD=.4W TC=+.05%	02236	PZ7248
A18VR2	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02036	SZ 10939-98
A18VR3	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	02236	PZ7268
A18VR4	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	02236	PZ7260
A18VR5	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	02236	PZ7268
A19	08565-60022	1	ASSEMBLY, YIG DRIVER	28480	08565-60022

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A19C1	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A19C2	0160-0163		CAPACITOR-FXD .033UF +-10% 200VDC POLYE	0420J	295P33392
A19C3	0160-0174	1	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A19C4	0160-3466		CAPACITOR-FXD 100PF +-10% 1KVDC CER	28480	0160-3466
A19C5	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A19C6	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A19C7	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A19C8	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A19C9	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A19C10	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A19C11	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A19C12	0180-1731		CAPACITOR-FXD 4.7UF+-10% 50VDC TA	0420J	150D475X9050B2
A19CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A19E1	0340-0038	4	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0038
A19E2	0340-0038		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0038
A19E3	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E4	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E5	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E6	0340-0038		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0038
A19E7	0340-0038		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0038
A19E8	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E9	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E10	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E11	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E12	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E13	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19E14	0340-0060		TERMINAL-STUD SPCL-FDTHRU PRESS-MTG	0576I	FT-E-15
A19K1	0490-0884	1	RELAY-REED 1A 500MA 250VAC 24VDC-COIL	0274D	R-4175-3
A19L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A19L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A19L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A19MP1	08565-00010	1	BRACKET, HEAT SINK	28480	08565-00010
A19MP2	0340-0162	1	INSULATOR-XSTR ALUMINUM	28480	0340-0162
A19MP3	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A19MP4	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A19MP5	0340-0039		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A19MP6	0340-0039		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A19MP7	0340-0039		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A19MP8	0340-0039		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A19MP9	2190-0003	8	WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP10	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP11	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP12	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP13	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP14	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP15	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP16	2190-0003		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0003
A19MP17	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP18	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP19	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP20	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP21	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP22	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP23	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP24	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP25	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP26	2200-0109		SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A19MP27	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP28	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP29	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP30	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP31	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP32	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP33	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP34	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19MP35	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A19MP36	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A19Q1	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A19Q2	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A19Q3	1853-0414	2	TRANSISTOR PNP 2N6423 SI TO-66 PD=35W	28480	1853-0414
	6040-0239		THERMAL COMPOUND	99700	120-5GM
A19Q4	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A19Q5	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
A19Q6	1853-0414		TRANSISTOR PNP 2N6423 SI TO-66 PD=35W	28480	1853-0414
	6040-0239		THERMAL COMPOUND	99700	120-5GM
A19R1	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A19R2	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R3	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R4	0698-8835		RESISTOR 5K .1% .125W F TC=0+-10	28480	0698-8835
A19R5	2100-2039	4	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 10-TRN	03740	3070P
A19R6	0698-8810	1	RESISTOR 27.4K .1% .125W F TC=0+-15	28480	0698-8810
A19R7	0698-8900	1	RESISTOR 3.53K .1% .125W F TC=0+-10	28480	0698-8900
A19R8	2100-2039		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 10-TRN	03740	3070P
A19R9	0698-8809	1	RESISTOR 31.5K .1% .125W F TC=0+-15	28480	0698-8809
A19R10	0698-8831	1	RESISTOR 13.4K .1% .125W F TC=0+-10	28480	0698-8831
A19R11	0698-8811	1	RESISTOR 5.25K .1% .125W F TC=0+-10	28480	0698-8811
A19R12	0698-8835		RESISTOR 5K .1% .125W F TC=0+-10	28480	0698-8835
A19R13	0698-8829		RESISTOR 20K .1% .125W F TC=0+-10	28480	0698-8829
A19R14	2100-2039		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 10-TRN	03740	3070P
A19R15	0698-8902	1	RESISTOR 48K .1% .125W F TC=0+-15	28480	0698-8902
A19R16	0698-8901	1	RESISTOR 29.7K .1% .125W F TC=0+-10	28480	0698-8901
A19R17	2100-2039		RESISTOR-TRMR 20K 5% WW SIDE-ADJ 10-TRN	03740	3070P
A19R18	0698-8898	1	RESISTOR 22.6K .1% .125W F TC=0+-10	28480	0698-8898
A19R19	0698-8899	1	RESISTOR 15.3K .1% .125W F TC=0+-10	28480	0698-8899
A19R20	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A19R21	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A19R22	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	28480	0757-0123
A19R23	0683-1855	1	RESISTOR 1.8M 5% .25W FC TC=-900/+1100	01607	CR1855
A19R24	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A19R25	0698-8835		RESISTOR 5K .1% .125W F TC=0+-10	28480	0698-8835
A19R26	0698-8834	1	RESISTOR 9K .1% .125W F TC=0+-10	28480	0698-8834
A19R27	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R28	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R29	0698-8830	2	RESISTOR 14.4K .1% .125W F TC=0+-10	28480	0698-8830
A19R30	0698-8830		RESISTOR 14.4K .1% .125W F TC=0+-10	28480	0698-8830
A19R31	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A19R32	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A19R33	0698-3439	4	RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A19R34	0811-3476	1	RESISTOR 150 1% 25W PW TC=0+-2	28480	0811-3476
A19R35	0698-3431	4	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A19R36	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A19R37	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A19R38	0698-3449		RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
A19R39	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A19R40	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A19R41	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A19R42	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A19R43	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A19R44	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A19R45	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A19R46	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A19R47	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A19R48	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A19R49	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A19R50	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A19R51	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A19R52	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R53	0698-8833		RESISTOR 10K .1% .125W F TC=0+-10	28480	0698-8833
A19R54	0698-8836	2	RESISTOR 3.7K .1% .125W F TC=0+-10	28480	0698-8836
A19R55	0698-8836		RESISTOR 3.7K .1% .125W F TC=0+-10	28480	0698-8836
A19R56	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A19R57	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A19R58	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A19R59	0811-3477	1	RESISTOR 25 1% 25W PW TC=0+-2	28480	0811-3477
A19S1	3101-1274		SWITCH-SL SPDT-NS SUBMIN 2A 120VAC PC	10389	23-021-008
A19U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A19U2	1826-0261		IC 741 OP AMP	28480	1826-0261
A19U3	1826-0261		IC 741 OP AMP	28480	1826-0261
A19U4	1826-0261		IC 741 OP AMP	28480	1826-0261
A19U5	1826-0261		IC 741 OP AMP	28480	1826-0261

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A19VR1	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A19VR2	1902-3203		DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	0223G	FZ7206
A19VR3	1902-0197	3	DIODE-ZNR 82.5V 5% DO-15 PD=1W TC=+.082%	28480	1902-0197
A19VR4	1902-0197		DIODE-ZNR 82.5V 5% DO-15 PD=1W TC=+.082%	28480	1902-0197
A20	08565-60023	1	ASSEMBLY, BIAS	28480	08565-60023
A20C1	0160-3879		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A20C2	0160-3879		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A20CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR7			NOT ASSIGNED		
A20CR8			NOT ASSIGNED		
A20CR9			NOT ASSIGNED		
A20CR10			NOT ASSIGNED		
A20CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR17			NOT ASSIGNED		
A20CR18			NOT ASSIGNED		
A20CR19	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR20	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR21	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR23	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR24	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR26	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR27	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR28	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20MP1	0403-0026		GLIDE:NYLON	28480	0403-0026
A20MP2	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A20MP3	1480-0073		PIN:DRIVE 0.250" LG	28480	1480-0073
A20MP4	4040-0756	1	EXTRACTOR-PC BOARD WHT POLYC	28480	4040-0756
A20MP5	4040-0748		EXTRACTOR-PC BOARD BLK POLYC	28480	4040-0748
A20MP6	08565-00059		SHIELD	28480	08565-00059
A20MP7	2360-0111	2	SCREW-MACH 6-32 .188-IN-LG PAN-HD-POZI	28480	2360-0111
A20MP8	2360-0111		SCREW-MACH 6-32 .188-IN-LG PAN-HD-POZI	28480	2360-0111
A20Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A20Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A20Q3	1855-0081	14	TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q4	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q5	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q6	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q7	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q8	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A20Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A20Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A20R1	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R2	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R3	2100-2851		RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-202
A20R4	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	0329B	C4-1/8-TO-1961-F
A20R5	2100-1739		RESISTOR-TRMR 5K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-502
A20R6	2100-1739		RESISTOR-TRMR 5K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-502
A20R7	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R8	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R9	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R10	2100-2850	4	RESISTOR-TRMR 10K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-103
A20R11	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R12	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R13	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R14	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R15	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R16	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R17	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R18	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R19	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203
A20R20	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	3005P-1-203

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A20R21	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A20R22	2100-1972		RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	0374D	30A5P-1-203
A20R23	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R25	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R26	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R27	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R28	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R29	0757-0402	3	RESISTOR 110 1% .125W F TC=0+-100	03298	C4-1/8-T0-111-F
A20R30	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R31	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R32	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R33			NOT ASSIGNED		
A20R34			NOT ASSIGNED		
A20R35	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R36	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R37	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R38	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R39	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A20R40	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A20R41	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A20R42	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R43	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R44	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R45	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R46	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A20R47	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R48	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R49	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R50	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A20R51	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R52	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A20R53	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R54	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R55	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R56	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R57	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R58	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A20R59	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R60	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R61	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R62	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R63	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R64	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R65	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A20R66	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R67	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R68	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R69	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R70			NOT ASSIGNED		
A20R71	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R72	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R73	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R74	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A20R75	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R76	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R77	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R78	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R79	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R80	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R81	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R82	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A20R83	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A20R84	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A20R85	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A20R86	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A20R87	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A20R88	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A20R89	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R90	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R91	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R92	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A20R93	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R94	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R95	0698-3431		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A20R96	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A20R97	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20R98	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A20R99	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A20R100	2100-1972		RESISTOR-TRMR 20K 10% HW SIDE-ADJ 20-TRN	03740	3006P-1-203
A20R101	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A20U1	1826-0092		IC OP AMP	28480	1826-0092
A20U2	1826-0092		IC OP AMP	28480	1826-0092
A20U3	1826-0092		IC OP AMP	28480	1826-0092
A20U4	1826-0092		IC OP AMP	28480	1826-0092
A20U5	1826-0092		IC OP AMP	28480	1826-0092
A20U6	1826-0092		IC OP AMP	28480	1826-0092
A20U7	1826-0092		IC OP AMP	28480	1826-0092
A20U8	1826-0092		IC OP AMP	28480	1826-0092
A20VR1	1902-3094	6	DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR2	1902-3139	1	DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	02236	FZ7252
A20VR3	1902-3049	4	DIODE-ZNR 3.48V 2% DO-7 PD=.4W TC=-.058%	02036	BZ 10939-51
A20VR4	1902-3049		DIODE-ZNR 3.48V 2% DO-7 PD=.4W TC=-.058%	02036	BZ 10939-51
A20VR5	1902-3049		DIODE-ZNR 3.48V 2% DO-7 PD=.4W TC=-.058%	02036	BZ 10939-51
A20VR6	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR7	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR8	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR9	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR10	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	02036	BZ 10939-99
A20VR11	1902-3049		DIODE-ZNR 3.48V 2% DO-7 PD=.4W TC=-.058%	02036	BZ 10939-51
A21 (STANDARD)	08565-60024	1	ASSEMBLY, VIDEO	28480	08565-60024
A21C1	0180-2205		CAPACITOR-FXD .33UF+-10% 35VDC TA	04203	150D334X9035A2
A21C2	0180-2743		CAPACITOR-FXD .11UF+-10% 35VDC TA	28480	0180-2743
A21C3	0160-0163		CAPACITOR-FXD .033UF +-10% 200VDC POLYE	04203	292P33392
A21C4	0160-2151	2	CAPACITOR-FXD .011UF +-5% 200VDC POLYE	28480	0160-2151
A21C5	0160-0155		CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	04203	292P33292
A21C6	0160-2218		CAPACITOR-FXD 1000PF +-5% 300VDC	28480	0160-2218
A21C7	0160-0134		CAPACITOR-FXD 220PF +-5% 300VDC MICA0+70	28480	0160-0134
A21C8	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	04203	150D105X9035A2
A21C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A21C10	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	04203	150D104X9035A2
A21C11	0160-2254		CAPACITOR-FXD 7.5PF +-.25PF 500VDC	28480	0160-2254
A21C12	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	04203	150D106X9020B2
A21C13	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	04203	150D106X9020B2
A21C14	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	04203	150D225X9020A2
A21C15	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	04203	150D225X9020A2
A21C16	0160-2150		CAPACITOR-FXD 33PF +-5% 300VDC	28480	0160-2150
A21C17	0160-2254		CAPACITOR-FXD 7.5PF +-.25PF 500VDC	28480	0160-2254
A21CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR18	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR19	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR20	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR21			NOT ASSIGNED		
A21CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR23	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR24	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR26			NOT ASSIGNED		
A21CR27			NOT ASSIGNED		
A21CR28			NOT ASSIGNED		
A21CR29	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR30	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21CR31	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR32	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR33	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR34	1901-0179		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR35	1901-0179		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR36	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A21L1	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A21L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A21L3	9140-0114	9	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A21MP1	1480-0073		PINIDRIVE 0.250" LG	28480	1480-0073
A21MP2	1480-0073		PINIDRIVE 0.250" LG	28480	1480-0073
A21MP3	4040-0750		EXTRACTOR-PC BOARD RED POLYC	28480	4040-0750
A21MP4	4040-0749		EXTRACTOR-PC BOARD BRN POLYC	28480	4040-0749
A21Q1	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q12	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q15	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A21Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q17	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q23	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q25	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q27	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q28	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q29	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q30	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q31	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q32	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q33	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q34	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q35	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q36	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q37	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q38	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q39	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q40	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q41	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q42	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q43	1855-0050	4	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A21Q44	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q45	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q46	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q47	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q48	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q49	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q50	1855-0050		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A21Q51	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q52	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q53	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q54	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21R1	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R2	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R3	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R5 THRU A21R10			NOT ASSIGNED		

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21R11	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A21R12	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R13	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R15	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R16	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A21R17	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A21R18	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R19	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R21	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R22	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A21R23	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A21R24	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R25	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R26	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R27	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R29	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A21R30	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R31	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R32	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R33	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R34	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A21R35	0757-0470		RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A21R36	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R37	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R38			NOT ASSIGNED		
A21R39	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R40	0698-3453		RESISTOR 196K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1963-F
A21R41	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A21R42	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R43	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A21R44	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A21R45	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A21R46	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R47	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R48	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A21R49	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R50	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R51	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R52	2100-2850		RESISTOR-TRMR 10K 10% WW SIDE=ADJ 20-TRN	03740	3005P-1-103
A21R53	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R54	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R55	2100-3054		RESISTOR-TRMR 50K 10% C SIDE=ADJ 17-TRN	73138	89PR50K
A21R56	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R57	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R58	2100-3094	6	RESISTOR-TRMR 100K 10% C SIDE=ADJ 17-TRN	73138	89PR100K
A21R59	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R60	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R61	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R62	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R63	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R64	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R65	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R66	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R67	0698-7794	5	RESISTOR 10K .25% .125W F TC=0+-100	0299E	MFAC1/8-T0-1002-C
A21R68	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R69	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A21R70	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R71	2100-3094		RESISTOR-TRMR 100K 10% C SIDE=ADJ 17-TRN	73138	89PR100K
A21R72	0698-7421		RESISTOR 40K .25% .125W F TC=0+-100	0299E	MFAC1/8-T0-4002-C
A21R73	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R74	2100-3054		RESISTOR-TRMR 50K 10% C SIDE=ADJ 17-TRN	73138	89PR50K
A21R75	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PMF55-1/8-T2-2002-C
A21R76	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R77	2100-2850		RESISTOR-TRMR 10K 10% WW SIDE=ADJ 20-TRN	03740	3005P-1-103
A21R78	0698-7412	1	RESISTOR 13.3K .25% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-C
A21R79	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R80	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R81	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R82	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R83	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R84	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R85	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21R86	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A21R87	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R88	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A21R89	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A21R90	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A21R91	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A21R92	2100-2851		RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	03740	3006P-1-202
A21R93	0698-4055	2	RESISTOR 1K .25% .125W F TC=0+-100	03888	PME55-1/8-T0-1001-C
A21R94	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R95	0698-8860		RESISTOR 7.52K .25% .125W F TC=0+-100	28480	0698-8860
A21R96	0698-8869		RESISTOR 2.15K .25% .125W F TC=0+-100	28480	0698-8869
A21R97	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R98	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R99	0698-8873	2	RESISTOR 232 .25% .125W F TC=0+-100	28480	0698-8873
A21R100	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R101	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R102	0698-8872	2	RESISTOR 332 .25% .125W F TC=0+-100	28480	0698-8872
A21R103	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R104	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R105	0698-8870		RESISTOR 2.143K .25% .125W F TC=0+-100	28480	0698-8870
A21R106	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R107	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R108	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R109	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R110	0757-0817	2	RESISTOR 750 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-751-F
A21R111	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A21R112	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R113	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A21R114	0698-6721	2	RESISTOR 19K 1% .125W F TC=0+-25	28480	0698-6721
A21R115	0698-4482		RESISTOR 17.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1742-F
A21R116	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A21R117	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R118	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R119	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A21R120	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R121	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R122	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R123	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A21R124	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A2181	3101-1274		SWITCH-SL SPDT-NS SUBMIN 2A 120VAC PC	10389	23-021-008
A21VR1	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A21VR2	1902-0064		DIODE-ZNR 7.5V 5% DO-7 PD=.4W TC=+.05%	0223G	FZ7248
A21VR3	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A21VR4	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21 (OPTION 100)	08565-60103	1	ASSEMBLY, VIDEO - 100HZ (OPTION 100)	28480	08565-60103
A21C1	0180-1735		CAPACITOR-FXD ,22UF+-10% 35VDC TA	0420J	15ND224X9035A2
A21C2	0180-2743	2	CAPACITOR-FXD ,11UF+-10% 35VDC TA	28480	0180-2743
A21C3	0160-0163		CAPACITOR-FXD ,033UF +-10% 200VDC POLYE	0420J	295P33392
A21C4	0160-2151		CAPACITOR-FXD ,011UF +-5% 200VDC POLYE	28480	0160-2151
A21C5	0160-0155		CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	0420J	295P33292
A21C6	0160-2218	2	CAPACITOR-FXD 1000PF +-5% 300VDC	28480	0160-2218
A21C7	0160-0134	2	CAPACITOR-FXD 220PF +-5% 300VDC MICA0+70	28480	0160-0134
A21C8	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	15ND105X9035A2
A21C9	0160-2055		CAPACITOR-FXD ,01UF +80-20% 100VDC CER	28480	0160-2055
A21C10	0180-1743		CAPACITOR-FXD ,1UF+-10% 35VDC TA	0420J	15ND104X9035A2
A21C11	0160-2254	4	CAPACITOR-FXD 7.5PF +-.25PF 500VDC	28480	0160-2254
A21C12	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	15ND106X9020B2
A21C13	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	15ND106X9020B2
A21C14	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	15ND225X9020A2
A21C15	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	15ND225X9020A2
A21C16	0160-2150		CAPACITOR-FXD 33PF +-5% 300VDC	28480	0160-2150
A21C17	0160-2254		CAPACITOR-FXD 7.5PF +-.25PF 500VDC	28480	0160-2254
A21C18	0180-1743		CAPACITOR-FXD ,1UF+-10% 35VDC TA	0420J	15ND104X9035A2
A21C19	0180-2141	1	CAPACITOR-FXD 3.3UF+-10% 50VDC TA	0420J	15ND335X9050B2
A21CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR13	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR18	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR19	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR20	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR21	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A21CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR23	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR24	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR25	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR26	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR27	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR28			NOT ASSIGNED		
A21CR29	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR30	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR31	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR32	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR33	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR34	1901-0179	4	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR35	1901-0179		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A21CR36	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR37	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR38	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR39	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21CR40	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A21L1	9140-0210		COIL-MLD 100UH 5% Q=50 ,155DX.375LG	02178	15-1315-12J
A21L2	9140-0210		COIL-MLD 100UH 5% Q=50 ,155DX.375LG	02178	15-1315-12J
A21L3	9140-0114		COIL-MLD 10UH 10% Q=55 ,155DX.375LG	02178	15-4445-2K
A21MP1	1480-0073		PIN;DRIVE 0.250" LG	28480	1480-0073
A21MP2	1480-0073		PIN;DRIVE 0.250" LG	28480	1480-0073
A21MP3	4040-0750		EXTRACTOR-PC BOARD RED POLYC	28480	4040-0750
A21MP4	4040-0749		EXTRACTOR-PC BOARD BRN POLYC	28480	4040-0749
A21Q1	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q2			NOT ASSIGNED		
A21Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q12	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q15	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A21Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q17	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q22	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q23	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q25	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q27	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q28	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q29	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q30	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q31	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q32	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q33	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q34	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q35	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q36	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q37	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q38	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q39	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q40	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q41	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q42	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q43	1855-0050		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A21Q44	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q45	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q46	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q47	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q48	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q49	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q50	1855-0050		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A21Q51	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q52	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q53	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A21Q54	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q55	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q56	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A21Q57	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A21Q58	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21Q59	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A21R1	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R2	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R3	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R5	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A21R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R7	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R8	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R9	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R10	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A21R11	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A21R12	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R13	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R15	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R16	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A21R17	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A21R18	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R19	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21R21	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R22	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A21R23	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A21R24	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R25	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R26	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R27	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R29	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A21R30	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R31	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R32	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R33	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R34	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A21R35	0757-0470	6	RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A21R36	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R37	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R38	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A21R39	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R40	0698-3453		RESISTOR 196K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1963-F
A21R41	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A21R42	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R43	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A21R44	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A21R45	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A21R46	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R47	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R48	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A21R49	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R50	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R51	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R52			NOT ASSIGNED		
A21R53	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R54	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R55	2100-3054		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A21R56	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R57	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R58	2100-3094		RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A21R59	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R60	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R61	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R62	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R63	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R64	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A21R65	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R66	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R67	0698-7794		RESISTOR 10K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-1002-C
A21R68	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R69	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A21R70	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R71	2100-3094		RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A21R72	0698-7553	1	RESISTOR 33.6K .5% .125W F TC=0+-50	0299E	MF4C1/8-T2-3362-D
A21R73	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R74	2100-3054		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A21R75	0698-6109	1	RESISTOR 18.2K .25% .125W F TC=0+-100	28480	0698-6109
A21R76	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R77	2100-2830		RESISTOR-TRMR 10K 10% WW SIDE-ADJ 20-TRN	0374D	300SP-1-103
A21R78	0698-6533	1	RESISTOR 12.5K .1% .125W F TC=0+-25	28480	0698-6533
A21R79	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R80	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R81	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R82	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R83	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R84	0698-3447	11	RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R85	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R86	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A21R87	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R88	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A21R89	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A21R90	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A21R91	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A21R92	2100-2851		RESISTOR-TRMR 2K 10% WW SIDE-ADJ 20-TRN	0374D	300SP-1-202
A21R93	0698-4055		RESISTOR 1K .25% .125W F TC=0+-100	03888	PME55-1/8-T0-1001-C
A21R94	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R95	0698-8860	2	RESISTOR,7.52K .25% .125W	28480	0698-8860

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21R96	0698-8869	2	RESISTOR, 150 .25% .125W	28480	0698-8869
A21R97	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R98	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R99	0698-8873		RESISTOR, 232 .25% .125W	28480	0698-8873
A21R100	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R101	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R102	0698-8872		RESISTOR, 532 .25% .125W	28480	0698-8872
A21R103	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R104	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R105	0698-8870	2	RESISTOR, 2143 .25% .125W	28480	0698-8870
A21R106	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R107	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R108	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A21R109	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R110	0757-0817		RESISTOR 750 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-751-F
A21R111	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A21R112	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A21R113	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A21R114	0698-6721		RESISTOR 19K 1% .125W F TC=0+-25	28480	0698-6721
A21R115	0698-4482		RESISTOR 17.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1742-F
A21R116	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A21R117	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A21R118	0698-3440	20	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R119	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A21R120	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R121	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A21R122	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21R123	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A21R124	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A21R125	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A21R126	0698-7421		RESISTOR 40K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-4002-C
A21R127	0698-3194		RESISTOR 20K .25% .125W F TC=0+-50	03888	PME55-1/8-T2-2002-C
A21R128	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R129	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A21R130	0698-5813	1	RESISTOR 220K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2203-F
A21R131	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A21S1	3101-1274		SWITCH-SL SPDT-NS SUBMIN 2A 120VAC PC	10389	23.021-008
A21U1	1826-0092		IC OP AMP	28480	1820-0092
A21VR1	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A21VR2	1902-0064		DIODE-ZNR 7.5V 5% DO-7 PD=.4W TC=+.05%	0223G	FZ7248
A21VR3	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A21VR4	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22	08565-60111	1	ASSEMBLY, LOG AMPLIFIER	28480	08565-60111
A22C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C2	0160-3459	11	CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C3	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C4	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C5	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C7	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C8	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C18	0160-2234	1	CAPACITOR-FXD .51PF +-.25PF 500VDC	28480	0160-2234
A22C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C20	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A22C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C28	0180-0228	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A22C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C30	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A22C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C40	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A22C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C43	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C44	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C45			NOT ASSIGNED		
A22C46	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C51	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A22C52	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A22C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C54	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C56	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C57	0160-2256	1	CAPACITOR-FXD 9.1PF +-.25PF 500VDC	28480	0160-2256
A22C58	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C62	0140-0195	2	CAPACITOR-FXD 130PF +-5% 300VDC MICA	72136	DM15F131J0300WV1CR
A22C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C64	0160-2308		CAPACITOR-FXD 36PF +-5% 300VDC	28480	0160-2308
A22C65	0160-2240	1	CAPACITOR-FXD 2PF +-.25PF 500VDC	28480	0160-2240
A22C66	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C67	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A22C68	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C69	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C70	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22C71	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C72	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C73	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C74	0180-2206	1	CAPACITOR-FXD 60UF+-10% 6VDC TA	0420J	150D606X9006B2
A22C75	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C76	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C77	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A22C78	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A22CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR3	1901-1085	19	DIODE-SCHOTTKY	28480	1901-1085
A22CR4	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR5	1901-0047	28	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A22CR6	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A22CR7	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A22CR8	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR9	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR10	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR11	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR12	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR13	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR14	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR15	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR16	1901-1070	18	DIODE-PIN	28480	1901-1070
A22CR17	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR18	1901-1070		DIODE-PIN	28480	1901-1070
A22CR19	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR20	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR21	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR22	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR23	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR24	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR25	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR26	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR27	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR28	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A22CR29	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR30	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR31	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22CR32	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A22E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A22L1	9100-1622	2	COIL-MLD 24UH 5% Q=60 .155DX.375LG	02178	15-4455-1J
A22L2	9140-0105	1	COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A22L3	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L4	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L5	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L6	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L7	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L8	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L9	9100-1627	2	COIL-MLD 39UH 5% Q=60 .155DX.375LG	02178	15-1315-2J
A22L10	9100-1629	1	COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A22L11	9100-1622		COIL-MLD 24UH 5% Q=60 .155DX.375LG	02178	15-4455-1J
A22L12	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	02178	15-4435-2K
A22L13	9140-0145	1	COIL-MLD 8.2UH 10% Q=60 .095DX.25LG	02178	09-4446-3K
A22L14	9100-2269	1	COIL-MLD 27UH 10% Q=45 .095DX.25LG	02178	09-1316-5K
A22Q1	1854-0071	10	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A22Q2	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q3	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q4	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q5	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q8	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q9	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q10	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q11	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q12	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q13	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q14	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q15	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A22Q16	1853-0020	2	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A22Q17	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A22Q18	1854-0345	10	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A22Q19	1853-0015	2	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A22Q20	1854-0475	1	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A22Q22	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A22Q23	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A22Q24	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A22Q25	1854-0039		TRANSISTOR NPN 2N3053S SI TO-39 PD=1W	0203G	2N3053
A22R1	2100-3109	3	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	73138	89PR2K
A22R2	2100-3161	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A22R3	2100-3109		RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	73138	89PR2K
A22R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R5	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R6	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R8	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R9	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R10	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A22R11	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A22R12	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A22R13	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R14	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A22R15	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A22R16	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A22R17	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A22R18			NOT ASSIGNED		
A22R19	0698-0083		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A22R20	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R21	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R22	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R23	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R24	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R25	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R26	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A22R27	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R28	0698-3449		RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
A22R29	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A22R30	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A22R31	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R32	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R33	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R34	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R35	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R36	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A22R37	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R38	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R39	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A22R40	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R41	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R42	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R43	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R44			NOT ASSIGNED		
A22R45	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R46	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A22R47	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R48	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R49*	0757-0416	28	RESISTOR 511 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-511R-F
A22R50	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R51	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R52	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A22R53	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A22R54	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R55	0698-3151	5	RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A22R56	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A22R57	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R58	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F
A22R59	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R60	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A22R61	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R62	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A22R63	0698-3159		RESISTOR 26.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2612-F
A22R64	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R65*	0757-0290	29	RESISTOR 6.19K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	0299E	MFAC1/8-T0-6191-F
A22R66	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R67	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R68	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-1332-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22R69*	0757-0440	17	RESISTOR 7.5K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-7501-F
A22R70	0757-0463	1	RESISTOR 82.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8252-F
A22R71	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R72	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R73	0757-0343		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R74	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A22R75	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R76	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-1332-F
A22R77	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R78	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R79	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R80	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R81	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	03298	C4-1/8-T0-121R-F
A22R82	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R83	0757-0418	7	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A22R84	0757-0402		RESISTOR 110 1% .125W F TC=0+-100	03298	C4-1/8-T0-111-F
A22R85	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R86			NOT ASSIGNED		
A22R87	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-1332-F
A22R88	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A22R89	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R90	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R91	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R92	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R93	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A22R94	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R95	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-1332-F
A22R96	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R97	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R98	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R99	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R100	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R101	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R102	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R103	0757-0405	5	RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A22R104	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R105	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A22R106	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-1332-F
A22R107	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-9091-F
A22R108	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A22R109	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R110	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R111	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A22R112	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A22R113	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A22R114	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A22R115	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A22R116	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-1332-F
A22R117	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A22R118	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A22R119	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R120	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A22R121	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A22R122	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A22R123	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A22R124	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A22R125	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A22R126	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A22R127	0757-0421	4	RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A22R128	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R129	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFaC1/8-T0-6191-F
A22R130	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A22U1	1826-0092		IC OP AMP	28480	1826-0092
A22VR1	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=+.009%	0203G	BZ 10939-98
A22VR2	1902-0048		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	0223G	FZ7244
A22VR3	1902-0579	1	DIODE-ZNR 5.11V 5% DO-15 PD=1W TC=+.009%	28480	1902-0579
A23	08565-60034	1	ASSEMBLY, BANDWIDTH FILTER NO. 2	28480	08565-60034
A23C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C2	0160-0127	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A23C3	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A23C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C5	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A23C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C8	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A23C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C13	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A23C14	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A23C15	0121-0059	4	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A23C16	0160-2244	2	CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A23C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C20	0140-0194	4	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A23C21	0160-3431	4	CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A23C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A23C23	0121-0036	5	CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A23C24			NOT ASSIGNED		
A23C25	0121-0446	4	CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146H	78-TRIKO-19 4.5-20 PF, N750
A23C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C29	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A23C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C31	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A23C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C33	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A23C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C37	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A23C38	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A23C39	0160-2241	2	CAPACITOR-FXD 2.2PF +-.25PF 500VDC	28480	0160-2241
A23C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C41	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A23C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C43	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A23C44	0160-3431		CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A23C45	0121-0036		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A23C46	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A23C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C51	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C52	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C54	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146H	78-TRIKO-19 4.5-20 PF, N750
A23C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C56			NOT ASSIGNED		
A23C57			NOT ASSIGNED		
A23C58			NOT ASSIGNED		
A23C59			NOT ASSIGNED		
A23C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C64	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C66	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C67	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A23C68			NOT ASSIGNED		
A23C69			NOT ASSIGNED		
A23C70			NOT ASSIGNED		
A23C71			NOT ASSIGNED		
A23C72			NOT ASSIGNED		
A23C73	0121-0452	5	CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A23C74	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A23CR1	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR2	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR3	1901-1070		DIODE-PIN	28480	1901-1070
A23CR4	1901-1070		DIODE-PIN	28480	1901-1070
A23CR5	1901-1070		DIODE-PIN	28480	1901-1070

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A23CR6	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR7			NOT ASSIGNED		
A23CR8	1901-1070		DIODE-PIN	28480	1901-1070
A23CR9	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR10	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR11	1901-1070		DIODE-PIN	28480	1901-1070
A23CR12	1901-1070		DIODE-PIN	28480	1901-1070
A23CR13	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR14	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR15	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR16	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23CR17	1901-0535	2	DIODE-SCHOTTKY	28480	1901-0535
A23CR18	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A23E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A23L1	9140-0112	4	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15-4425-14K
A23L2	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A23L3	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A23L4	9100-1624	9	COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A23L5	9140-0179	18	COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A23L6	9100-3854	4	COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A23L7	9140-0098	4	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A23L8	9140-0178	2	COIL-MLD 12UH 10% Q=65 .155DX.375LG	02178	15-4445-3K
A23L9	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A23L10	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A23L11	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A23L12	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A23L13	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A23L14	9100-1620	3	COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A23L15	9100-3854		COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A23L16	9140-0144	5	COIL-MLD 4.7UH 10% Q=45 .095DX.25LG	02178	09-4436-8K
A23L17	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A23MP1	08565-00024	3	BAFFLE, INDUCTOR	28480	08565-00024
A23Q1	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A23Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A23Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A23Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A23Q5	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A23Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A23Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A23Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A23Q9	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A23Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A23R1	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-8251-F
A23R2	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1002-F
A23R3	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	0329B	C4-1/8-T0-121R-F
A23R4			NOT ASSIGNED		
A23R5	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	0329B	C4-1/8-T0-162R-F
A23R6	0698-3431		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A23R7	0698-3427	2	RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A23R8	0757-0399	6	RESISTOR 82.5 1% .125W F TC=0+-100	0329B	C4-1/8-T0-82R5-F
A23R9	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-4641-F
A23R10	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A23R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5111-F
A23R12	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1102-F
A23R13	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	0329B	C4-1/8-T0-383R-F
A23R14	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	0329B	C4-1/8-T0-10R0-F
A23R15	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	0329B	C4-1/8-T0-147R-F
A23R16	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	0329B	C4-1/8-T0-316R-F
A23R17	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	0329B	C4-1/8-T0-237R-F
A23R18	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A23R19	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5621-F
A23R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A23R21	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2152-F
A23R22	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1002-F
A23R23	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-7501-F
A23R24	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1782-F
A23R25	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1003-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A23R26	2100-3094		RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A23R27	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A23R28	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A23R29	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A23R30	0757-0400	2	RESISTOR 90.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-90R9-F
A23R31	2100-3052	2	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A23R32			NOT ASSIGNED		
A23R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A23R34	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A23R35	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A23R36	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A23R37	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A23R38	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A23R39	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A23R40	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A23R41	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A23R42	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A23R43	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A23R44	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A23R45	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A23R46	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A23R47	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A23R48	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A23R49	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A23R50			NOT ASSIGNED		
A23R51	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A23R52	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A23R53	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A23R54	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A23R55	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A23R56	0757-0424		RESISTOR 1.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1101-F
A23R57	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A23R58	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A23R59	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A23R60	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A23VR1	1902-0048		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	02235	FZ7244
A23Y1,Y2 (STANDARD)	0410-0450	3	CRYSTAL, 21.4 MHZ, MATCHED SET OF 4 (INCLUDES A27Y1,2)	28480	0410-0450
A23Y1,Y2 (OPTION 100)	0410-0589	3	CRYSTAL, 21.4 MHZ, MATCHED SET OF FIVE (INCLUDES A27Y1, Y2 AND A25Y1)	28480	0410-0589
A24 (STANDARD)	08557-60009	1	ASSEMBLY, STEP GAIN AMPLIFIER	28480	08557-60009
A24C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C2	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C12	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A24C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C16	0160-3457	3	CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A24C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C19	0160-3457		CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A24C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C22	0160-3457		CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3457
A24C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C24	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A24C25	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A24CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A24CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A24CR3	1901-1070		DIODE-PIN	28480	1901-1070
A24CR4	1901-1070		DIODE-PIN	28480	1901-1070
A24CR5	1901-1070		DIODE-PIN	28480	1901-1070
A24CR6	1901-1070		DIODE-PIN	28480	1901-1070
A24E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24L1	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L2	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L3	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L4	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L5	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L6	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L7	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L8	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A24L9	9100-2260	1	COIL-MLD 1.8UH 10% Q=32 .095DX.25LG	28480	9100-2260
A24L10	9140-0158	5	COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A24Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24Q2	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24Q6	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A24R1	2100-3103	4	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A24R2	2100-3103		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A24R3	2100-3054		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A24R4	2100-3061		RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	73138	89PR500K
A24R5	2100-3103		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A24R6	2100-3056		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A24R7			NOT ASSIGNED		
A24R8	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-9091-F
A24R9	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A24R10	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A24R11	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R12	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R13	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-9091-F
A24R14	0757-0395	9	RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R15	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A24R16	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A24R17	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-6191-F
A24R18	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A24R19	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-6191-F
A24R20	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R21	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A24R22	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R23	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R24	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R26	0757-0417		RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A24R27	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R28	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R29	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R30	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R31	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R32	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A24R33	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R34	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R35	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R36	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R37	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R38	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A24R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R40	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A24R41	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A24R42	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A2481	3101-0973	1	SWITCH-SL DPDT-N8 MINTR .5A 125VAC/DC PC	0487F	GF126-0018
A24 (OPTION 100)	08565-60104	1	ASSEMBLY, STEP GAIN AMPLIFIER/OSCILLATOR	28480	08565-60104
A24C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C2	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A24C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C15			NOT ASSIGNED		
A24C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C24	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A24C25	0160-2307		CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A24C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C30	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A24C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C32	0140-0198	3	CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A24C33	0160-2204		CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A24C34	0160-2264		CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A24C35	0121-0036		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A24C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A24E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E9	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24E10	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A24L1	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A24L2	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24L3	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A24L4			NOT ASSIGNED		
A24L5	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24L6	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24L7	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24L8	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24L9	9140-0121	1	COIL-MLD 1.8UH 10% Q=33 .155DX.375LG	02178	15.4425-9K
A24L10	9140-0096	1	COIL-MLD 1UH 10% Q=50 .155DX.375LG	02178	15.4425-6K
A24L11	9100-1615	1	COIL-MLD 1.2UH 10% Q=33 .155DX.375LG	02178	15.4425-7K
A24L12	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15.4445-7J
A24Q1	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500 MHZ	28480	1853-0015
A24Q2	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q3	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400 MW	0203G	2N2907A
A24Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q5	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A24Q6	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A24Q8	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A24Q9	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A24Q10	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A24Q11	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A24Q12 THRU					
A24Q15	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A24R1	2100-3056	3	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A24R2	2100-3061	3	RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	73138	89PR500K
A24R3	2100-3054		RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A24R4	2100-3061		RESISTOR-TRMR 500K 10% C SIDE-ADJ 17-TRN	73138	89PR500K
A24R5	2100-3103		RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A24R6	2100-3056		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A24R7			NOT ASSIGNED		
A24R8	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-9091-F
A24R9	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A24R10	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R11	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R12	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R13	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-9091-F
A24R14	0698-3433	3	RESISTOR 28.7 1% .125W F TC=0+-100	03888	PMF55-1/8-T0-28R7-F
A24R15			NOT ASSIGNED		
A24R16	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R17	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-6191-F
A24R18			NOT ASSIGNED		
A24R19	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-6191-F
A24R20	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-6191-F
A24R21	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A24R22			NOT ASSIGNED		
A24R23	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R24	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R26	0757-0417		RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A24R27	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A24R28	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-6191-F
A24R29	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R30	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R31	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R32	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215-F
A24R33	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R34	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-6191-F
A24R35	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A24R36	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A24R37	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R38	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A24R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R40	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A24R41	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A24R42	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A24R43	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R44	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A24R45	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R46	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A24R47	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A24R48	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A24R49	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A24R50	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A24R51	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R52	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R53	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R54	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A24R55	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A24R56	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R57	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A24R58	0757-0288		RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-9091-F
A24R59	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R60	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R61	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A24R62	0698-3433		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PMF55-1/8-T0-28R7-F
A24R63	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R64	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A24R65	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A24S1	3101-0684	1	SWITCH-SL DPDT-NS MINTR 1A 125VAC PC	28480	3101-0684
A24Y1	0410-0671	1	CRYSTAL, 18.4 MHZ	28480	0410-0671
A25 (OPTION 100)	08565-60025	1	ASSEMBLY, UP-DOWN CONVERTER (OPTION 100)	28480	08565-60025
A25C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C2	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A25C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C6	0140-0199		CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300AV1CR
A25C7	0160-2221	2	CAPACITOR-FXD 1300PF +-5% 300VDC	28480	0160-2221
A25C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A25C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C12	0140-0192	1	CAPACITOR-FXD 68PF +-5% 300VDC	72136	DM15E680J0300WV1CR
A25C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C14	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A25C15	0160-2250	1	CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A25C16	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A25C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C19	0160-2208	1	CAPACITOR-FXD 330PF +-5% 300VDC MICA 0+70	28480	0160-2208
A25C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C24	0121-0453	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-195
A25C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C31	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A25C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C36			NOT ASSIGNED		
A25C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A25CR1	1901-0639	9	DIODE-PIN 110V	28480	5082-3080
A25CR2	1901-0639		DIODE-PIN 110V	28480	5082-3080
A25CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A25E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A25L1	9100-1611	1	COIL-MLD 220NH 20% Q=50 .155DX.375LG	0217B	15-4415-2M
A25L2	9100-1627		COIL-MLD 39UH 5% Q=60 .155DX.375LG	0217B	15-1315-2J
A25L3	9100-2247	4	COIL-MLD 100NH 10% Q=34 .095DX.25LG	0217B	09-4416-1K
A25L4	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	0217B	15-4435-2K
A25L5	9100-1618	1	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	0217B	15-4435-1K
A25L6	9100-1617	2	COIL-MLD 3.9UH 10% Q=33 .155DX.375LG	0217B	15-4425-13K
A25L7	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	0217B	15-4465-1J
A25L8	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	0217B	15-4465-1J
A25Q1	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A25Q2	1854-0247	3	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A25Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A25Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A25Q5	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A25Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A25Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A25Q8	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A25Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A25Q10	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A25Q11	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	0203G	2N2907A
A25R1	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	0329B	C4-1/8-T0-10R0-F
A25R2	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A25R3	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A25R4	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A25R5	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A25R6	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A25R7	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A25R8	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A25R9	0757-0319	4	RESISTOR 63.4K 1% .25W F TC=0+-100	0341B	C5-1/4-T0-6342-F
A25R10	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-5111-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A25R11	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A25R12	0757-0319		RESISTOR 63.4K 1% .25W F TC=0+-100	03418	C5-1/4-T0-6342-F
A25R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A25R14	0698-3441	7	RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A25R15	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A25R16	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A25R17	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A25R18	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A25R19	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A25R20	2100-3109		RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	73138	89PR2K
A25R21	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A25R22	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A25R23	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A25R24	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A25R25	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A25R26	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A25R27	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A25R28	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A25R29	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A25R30	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A25R31	0757-0319		RESISTOR 63.4K 1% .25W F TC=0+-100	03418	C5-1/4-T0-6342-F
A25R32	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A25R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A25R34	0757-0319		RESISTOR 63.4K 1% .25W F TC=0+-100	03418	C5-1/4-T0-6342-F
A25R35	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A25R36	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A25R37	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A25R38	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A25R39	0683-0475	2	RESISTOR 4.7 5% .25W FC TC=-400/+500	01606	CB4705
A25R40	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A25R41	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A25R42	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A25R43	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A25R44	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A25R45	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A25R46	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A25R47	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A25R48	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A25T1	85662-60002	1	COIL ASSEMBLY, TRANSFORMER	28480	85662-60002
A25U1	0955-0063	1	MIXER, DOUBLE-BALANCED 200MW	28480	0955-0063
A25U2	0955-0063	1	MIXER, DOUBLE-BALANCED 200MW	28480	0955-0063
A26 (OPTION 100)	08565-60026	1	ASSEMBLY, 3 MHZ FILTER (OPTION 100)	28480	08565-60026
A26C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C2	0121-0444	5	CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146H	78-TRIKO-19 3-9 PF, N075
A26C3	0121-0105	5	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A26C4	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C7	0160-2202		CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A26C8	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C9	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C10	0160-4300	4	CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A26C11	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A26C12	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146H	78-TRIKO-19 3-9 PF, N075
A26C13	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A26C14	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C16	0160-2202		CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A26C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C18	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C19	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146H	78-TRIKO-19 3-9 PF, N075
A26C20	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A26C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C22	0160-2202		CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A26C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C24	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C25	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146H	78-TRIKO-19 3-9 PF, N075
A26C26	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A26C27	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z822-CDH
A26C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C30	0160-2202		CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26C31	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26C32	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A26C33	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A26C34	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C37	0160-2202		CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A26C38	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C093F101L473Z822-CDM
A26C39	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A26C42	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C093F101L473Z822-CDM
A26C43	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26C44	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26C45	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C093F101M223Z822-CDM
A26CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR8	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR10	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR13			NOT ASSIGNED		
A26CR14	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A26L1	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A26L2	9100-1631	5	COIL-MLD 56UH 5% Q=55 .155DX.375LG	02178	15-1315-6J
A26L3	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A26L4	9100-1631		COIL-MLD 56UH 5% Q=55 .155DX.375LG	02178	15-1315-6J
A26L5	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A26L6	9100-1631		COIL-MLD 56UH 5% Q=55 .155DX.375LG	02178	15-1315-6J
A26L7	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A26L8	9100-1631		COIL-MLD 56UH 5% Q=55 .155DX.375LG	02178	15-1315-6J
A26L9	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A26L10	9100-1631		COIL-MLD 56UH 5% Q=55 .155DX.375LG	02178	15-1315-6J
A26L11	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A26L12	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A26L13	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A26Q1	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q2	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q3	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q5	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q7	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q9	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q11	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26Q13	1854-0637		TRANSISTOR NPN 2N2219A SI TO-5 PD=800MW	28480	1854-0637
A26R1	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A26R2	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A26R3	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A26R4	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A26R5	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R6	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R7	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R8	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A26R9	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A26R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A26R11	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R12	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A26R13	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A26R14	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A26R15	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R16	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A26R17	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R18	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R19	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A26R20	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26R21	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A26R22	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A26R23	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R24	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A26R25	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R26	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A26R27	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R28	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R29	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A26R30	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A26R31	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A26R32	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A26R33	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R34	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R35	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A26R36	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R37	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R38	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A26R39	0757-0447		RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A26R40	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A26R41	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A26R42	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R43	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R44	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A26R45	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R46	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A26R47	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A26R48	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A26R49	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A26R50	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A26R51	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A26R52	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A26R53	2100-2574	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	0365A	ET50X501
A26R54	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A26R55	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R56	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A26R57	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A26R58	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A26R59	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A26R60	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A26R61	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A26R62	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A26R63	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A26R64	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A26R65	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A26Y1 THRU A26Y5	0410-0404	1	CRYSTAL:QUARTZ, MATCHED SET OF FIVE, 3MHZ	0013F	0410-0404

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A27	08565-60033	1	ASSEMBLY, BANDWIDTH FILTER NO. 1	28480	08565-60033
A27C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C2	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A27C3	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A27C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C5	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A27C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C8	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A27C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C13	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A27C14	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A27C15	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A27C16	0160-2244		CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A27C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C20	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A27C21	0160-3431		CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A27C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A27C23	0121-0036		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A27C24			NOT ASSIGNED		
A27C25	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146H	78-TRIKD-19 4.5-20 PF, N750
A27C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C29	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A27C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C31	0160-3459		CAPACITOR-FXD .02UF +-20% 100VDC CER	28480	0160-3459
A27C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C33	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A27C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C37	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A27C38	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A27C39	0160-2241		CAPACITOR-FXD 2.2PF +-.25PF 500VDC	28480	0160-2241
A27C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C41	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A27C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C43	0160-3431		CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A27C44	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A27C45	0121-0036		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A27C46	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A27C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C51	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C52	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C54	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146H	78-TRIKD-19 4.5-20 PF, N750
A27C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C56 THRU A27C59			NOT ASSIGNED		
A27C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C64	0160-3533		CAPACITOR-FXD 470PF +-5% 300VDC MICA0+70	28480	0160-3533
A27C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C66	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C67	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A27C68 THRU A27C72			NOT ASSIGNED		
A27C73	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A27C74	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A27CR1	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR2	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR3	1901-1070		DIODE-PIN	28480	1901-1070
A27CR4	1901-1070		DIODE-PIN	28480	1901-1070
A27CR5	1901-1070		DIODE-PIN	28480	1901-1070

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A27CR6	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR7			NOT ASSIGNED		
A27CR8	1901-1070		DIODE-PIN	28480	1901-1070
A27CR9	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR10	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR11	1901-1070		DIODE-PIN	28480	1901-1070
A27CR12	1901-1070		DIODE-PIN	28480	1901-1070
A27CR13	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR14	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR15	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR16	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A27CR17	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A27E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A27L1	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15-4425-14K
A27L2	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A27L3	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A27L4	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A27L5	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A27L6	9100-3854		COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A27L7	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A27L8	9140-0178		COIL-MLD 12UH 10% Q=65 .155DX.375LG	02178	15-4445-3K
A27L9	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A27L10	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A27L11	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A27L12	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A27L13	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A27L14	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A27L15	9100-3854		COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A27L16	9140-0144		COIL-MLD 4.7UH 10% Q=45 .095DX.25LG	02178	09-4436-8K
A27L17	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15-4465-1J
A27MP1	08565-00024		BAFFLE, INDUCTOR	28480	08565-00024
A27Q1	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A27Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A27Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A27Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A27Q5	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A27Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A27Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A27Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A27Q9	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A27Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A27R1	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A27R2	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A27R3	0757-0402		RESISTOR 110 1% .125W F TC=0+-100	03298	C4-1/8-T0-111-F
A27R4			NOT ASSIGNED		
A27R5	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A27R6	0698-3431		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-23R7-F
A27R7	0698-3427		RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A27R8	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A27R9	0698-3153		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A27R10	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A27R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A27R12	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A27R13	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A27R14	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A27R15	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A27R16	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A27R17	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A27R18	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A27R19	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A27R20	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A27R21	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A27R22	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A27R23	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A27R24	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A27R25	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A27R26	2100-3094		RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A27R27	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A27R28	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A27R29	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A27R30	0757-0400		RESISTOR 90.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-90R9-F
A27R31	2100-3052		RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A27R32			NOT ASSIGNED		
A27R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A27R34	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A27R35	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A27R36	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A27R37	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A27R38	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A27R39	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A27R40	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A27R41	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A27R42	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A27R43	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A27R44	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A27R45	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A27R46	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A27R47	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A27R48	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A27R49	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A27R50			NOT ASSIGNED		
A27R51	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A27R52	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A27R53	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A27R54	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A27R55	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2152-F
A27R56	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A27R57	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	0160G	CC
A27R58	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A27R59	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	0160G	CC
A27R60	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A27VR1	1902-0048		DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	0223G	FZ7244
A27Y1,Y2 (STANDARD)	0410-0450		CRYSTAL, 21.4MHZ, MATCHED SET OF FOUR (INCLUDES A23Y1,Y2)	28480	0410-0450
A27Y1,Y2 (OPTION 100)	0410-0589		CRYSTAL, 21.4MHZ, MATCHED SET OF FIVE (INCLUDES A23Y1,Y2 AND A25Y1)	28480	0410-0589
A28	08565-60027	1	ASSEMBLY, VARIABLE GAIN	28480	08565-60027
A28C1	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A28C2	0140-0195		CAPACITOR-FXD 130PF +-5% 300VDC MICA	72136	DM15F131J0300WV1CR
A28C3	0140-0198		CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A28C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C14	0160-2253	1	CAPACITOR-FXD 6.8PF +-.25PF 500VDC	28480	0160-2253
A28C15	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A28C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A28C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A28CR1	1901-0639		DIODE-PIN 110V	28480	5082-3080
A28CR2	1901-0639		DIODE-PIN 110V	28480	5082-3080
A28CR3	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28CR4	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28CR5	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28CR6	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28CR7	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28CR8	1901-0639		DIODE-PIN 110V	28480	5082-3080
A28CR9	1901-0639		DIODE-PIN 110V	28480	5082-3080
A28CR10	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A28CR11	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A28CR12	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A28E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A28E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A28E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A28E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A28L1	9100-1610	2	COIL-MLD 150NH 20% Q=50 .155DX.375LG	0217B	15-4415-1M
A28L2	9100-1610		COIL-MLD 150NH 20% Q=50 .155DX.375LG	0217B	15-4415-1M
A28L3	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	0217B	15-4435-2K
A28L4	9100-1617		COIL-MLD 3.9UH 10% Q=33 .155DX.375LG	0217B	15-4425-13K
A28L5	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	0217B	15-4445-4K
A28L6	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	0217B	15-4435-2K
A28L7	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	0217B	15-4435-2K
A28L8	9100-1619		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG	0217B	15-4435-2K
A28L9	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	0217B	15-4465-1J
A28Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A28Q2	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A28Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A28Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A28Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A28Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A28Q7	1854-0247		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A28R1	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A28R2	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A28R3	0683-0475		RESISTOR 4.7 5% .25W FC TC=-400/+500	0160G	CB4705
A28R4	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A28R5	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A28R6	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A28R7	2100-3351		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A28R8	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A28R9	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A28R10	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A28R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A28R12	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A28R13	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A28R14	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A28R15	0698-3437		RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A28R16	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A28R17	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A28R18	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A28R19*	0757-0403	5	RESISTOR 121 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-121R-F
A28R20	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A28R21*	0757-0180	21	RESISTOR 31.6 1% .125W F TC=0+-100 *FACTORY SELECTED PART	28480	0757-0180
A28R22	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A28R23*	0757-0379	1	RESISTOR 12.1 1% .125W F TC=0+-100 *FACTORY SELECTED PART	0299E	MF4C1/8-T0-12R1-F
A28R24	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A28R25	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A28R26	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A28R27	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A28R28	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A28R29	0757-0444		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A28R30	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A28R31	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A28R32*	0698-3437	3	RESISTOR 133 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-133R-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A28R33*	0698-3437		RESISTOR 133 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-133R-F
A28R34	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A28R35	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A28R36	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A28R37	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A2881	3101-2190	1	SWITCH-SL DPDT-NS MINTR 1A 125VAC PC	28480	3101-2190
A28VR1	1902-3048	1	DIODE-ZNR 3.48V 5% DO-7 PD=.4W TC=-.058%	0203G	BZ 10939-50
A29	08565-60028	1	ASSEMBLY, RF-IF MOTHERBOARD	28480	08565-60028
A29C1	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C2	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C3	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C4	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C5	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C6	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C7	0160-4299	1	CAPACITOR-FXD 2200PF +-20% 250VDC CER	0420J	C067F251F222M822-CDH
A29C8	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C9	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C10	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C11	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A29C12	0180-0097	1	CAPACITOR-FXD 47UF+-10% 35VDC TA	0420J	150D476X903582
A29C13	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X901582
A29J1	1251-4458	1	CONNECTOR 50-PIN M RECTANGULAR	76381	3466-1003
A29J2	1251-4742	1	CONNECTOR 34-PIN M POST TYPE	76381	3404-1003
A29J3	1251-4736		CONNECTOR 26-PIN M RECTANGULAR	76381	3403-2003
A29J4	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0902812
A29J5	1251-4051	2	CONNECTOR 10-PIN M POST TYPE	27264	22-12-2101
A29J6	1250-0835	1	CONNECTOR-RF SMC M PC 50-OHM	0331F	37JR104-2
A29J7	1251-4051		CONNECTOR 10-PIN M POST TYPE	27264	22-12-2101
A29R1	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A29R2	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A29R3	0698-3392	1	RESISTOR 23.7 1% .5W F TC=0+-100	0552D	CMF-65-2
A29R4	0757-0464		RESISTOR 90.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-9092-F
A29R5	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A29R6	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A29R7	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A29R8	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A29R9	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A29R10	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A29XA1 THRU A29XA10			NOT ASSIGNED		
A29XA11	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A29XA12	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A29XA13	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A29XA14	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A29XA15	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A29XA16P1	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA16P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	0450G	252-06-30-300
A29XA17	1251-1365	13	CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA18	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA19	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA20	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA21	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA22	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA23	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA24	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA25	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA26	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA27	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A29XA28	1251-1365		CONNECTOR-PC EDGE 22-CONT/ROW 2-ROWS	0450G	252-22-30-300
A30	5086-7285	1	ASSEMBLY, 1ST MIXER	28480	5086-7285
	5086-6285		RESTORED 5086-7285,REQUIRES EXCHANGE	28480	5086-6285
A31	5086-7259	1	ASSEMBLY, YTO (2 TO 4.5 GHZ)	28480	5086-7259
	5086-7258	1	ASSEMBLY, YTO;ALTERNATE FOR 5086-7259	28480	5086-7258
A32	0960-0473	1	ASSEMBLY, YTF (1.7 TO 22 GHZ)	28480	0960-0473

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A33	5086-7283	1	ASSEMBLY, LIMITER	28480	5086-7283
A34	08565-60084	1	ASSEMBLY, RF ATTENUATOR	28480	08565-60084
A35	08565-60009	1	ASSEMBLY, SECOND CONVERTER	28480	08565-60009
A35C1	3030-0397	4	SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	28480	3030-0397
A35C2	3030-0397		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	28480	3030-0397
A35C3	3030-0397		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	28480	3030-0397
A35C4	3030-0397		SCREW-SET 10-32 1-IN-LG FLAT-PT BRS	28480	3030-0397
A35J1	1250-1157	1	CONNECTOR-RF SMA FEM THD-HOLE 50-OHM	0278H	08M 220
A35L1	08558-00034	1	COUPLING, LOOP INPUT	28480	08558-00034
A35L2	08558-00033	2	COUPLING, LOOP FILTER	28480	08558-00033
A35L3	08558-00033		COUPLING, LOOP FILTER	28480	08558-00033
A35MP1	08565-20067	1	BLOCK, CAVITY	28480	08565-20067
A35MP2	08565-20069	1	CAP, OUTER ELEMENT	28480	08565-20069
A35MP3	08565-20092	1	CAP, DIELECTRIC	28480	08565-20092
A35MP4	08565-20068	1	CAP, INNER ELEMENT	28480	08565-20068
A35MP5	2200-0171	1	SCREW-MACH 4-40 .75-IN-LG 82 DEG	28480	2200-0171
A35MP6	08565-20101	1	COVER, CAVITY, SECOND CONVERTER	28480	08565-20101
A35MP7	08565-00058	1	COVER, OSCILLATOR HOUSING	28480	08565-00058
A35MP8	2740-0001	3	NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	28480	2740-0001
A35MP9	2740-0001		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	28480	2740-0001
A35MP10	2740-0001		NUT-HEX-DBL-CHAM 10-32-THD .109-IN-THK	28480	2740-0001
A35MP11	2950-0078	2	NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	0331F	MN100-11
A35MP12	3030-0422	7	SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP13	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP14	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP15	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP16	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP17	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422
A35MP18	3050-0176	3	WASHER-FL MTLC NO. 8 .188-IN-ID	9A469	AA-0107-288
A35MP19	3050-0176		WASHER-FL MTLC NO. 8 .188-IN-ID	9A469	AA-0107-288
A35MP20	3050-0176		WASHER-FL MTLC NO. 8 .188-IN-ID	9A469	AA-0107-288
A35MP21	2190-0124	7	WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A35MP22	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A35MP23	2200-0105	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A35MP24	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A35MP25 THRU A35MP40	2200-0107	16	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A35MP41	2200-0113	2	SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A35MP42	2200-0113		SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0113
A35MP43	2200-0119	8	SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP44	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP45	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP46	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP47	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP48	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP49	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35MP50	2200-0119		SCREW-MACH 4-40 1-IN-LG PAN-HD-POZI	28480	2200-0119
A35A1	08565-60106	1	ASSEMBLY, SECOND CONVERTER OSC, HOUSING	28480	08565-60106
A35A1C1	0160-3036	2	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A35A1C2	0160-3036		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A35A1C3	0160-2436	1	CAPACITOR-FDTHRU 10PF 20% 200V CER	28480	0160-2436
A35A1C4	0140-0075	1	CAPACITOR-FDTHRU 22PF 10% 500V MICA	0456C	666-053-01A0-220K
A35A1CR1	1901-0633	1	DIODE-SCHOTTKY	28480	1901-0633
A35A1J1			NOT ASSIGNED		
A35A1J2	1250-1435	2	CONNECTOR,RF 50-OHM SMC JACK	2493A	A-1250-1435-1
A35A1J3	1250-0829	5	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
A35A1L1	9100-2255	2	COIL-MLD 470NH 10% Q=35 .095DX.25LG	02178	09-4426-2K
A35A1L2	08558-80009	1	COIL, SECOND CONVERTER OT	28480	08558-80009
	9170-1028	1	CORE-TUNING	0327C	066-63-518
A35A1MP1	08565-20066	1	HOUSING, OSCILLATOR CONVERTER	28480	08565-20066
A35A1MP2	08558-20074	1	INSULATOR, COUPLING POST	28480	08558-20074
A35A1MP3	2200-0151		SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A35A1MP4	0380-0373	1	STANDOFF-HEX .625LG 10-32THD .312A/F AL	0217J	8396-A-1032
A35A1MP5	08558-00032	1	MOUNTING TAB, MIXER DIODE	28480	08558-00032
A35A1MP6	0360-0002	1	TERMINAL-SLDR LUG PL-MTG FOR-#2-SCR	77147	4029
A35A1MP7	0520-0173	3	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0173
A35A1MP8	0520-0173		SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0173
A35A1MP9	0520-0173		SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0173
A35A1MP10	3030-0422		SCREW-SKT HD CAP 0-80 .188-IN-LG	28480	3030-0422

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A35A1MP11	3050-0003	1	WASHER-FL NM NO. 6 .141-IN-ID .375-IN-OD	0460D	1471
A35A1R1	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	0329B	C4-1/8-T0-10R0-F
A35A1A1	08558-60028	1	ASSEMBLY, SECOND CONVERTER OSCILLATOR	28480	08558-60028
A35A1A1Q1	5086-4218	2	HP-21 TO-72 PKG	28480	5086-4218
A35A1A1R1	0683-4705	1	RESISTOR 47 5% .25W FC TC=-400/+500	0160G	CB4705
A35A1A1R2	0683-2715	1	RESISTOR 270 5% .25W FC TC=-400/+600	0160G	CB2715
A35A2	08565-60010	1	ASSEMBLY, SECOND CONVERTER FILTER	28480	08565-60010
A35A2C1	0180-0098	1	CAPACITOR-FXD 100UF+-20% 20VDC TA	0420J	150D107X0020B2
A35A2C2	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X9010B2
A35A2CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A35A2Q1	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A35A2R1	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2610-F
A35A2R2	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	0329B	C4-1/8-T0-2610-F
A35A2R3	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1961-F
A35A2VR1	1902-3256	2	DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	0223G	FZ7296
A36	08555-60008	1	ASSEMBLY, TUNING STABILIZER	28480	08555-60008
A36C1	0160-2437	11	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36C2	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36C3	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36C4	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36C5	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36C6	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A36MP1	08555-20045	1	HOUSING, TUNING STABILIZER	28480	08555-20045
A36MP2	08555-00013	1	COVER, PLS AMP VCXO	28480	08555-00013
A36MP3	08555-00012	1	COVER, DISCRIMINATOR	28480	08555-00012
A36MP4	0360-0042		TERMINAL-SLDR LUG PL-MTG FOR-#6-SCR	28480	0360-0042
A36MP5	0330-0178	1	GASKET-SAMPLER 0.030" THICK	0770J	0330-0178
A36MP6	6960-0059	4	PLUG-HOLE RND-HD FOR .187-D-HOLE NYL	02768	207-120551-00
A36MP7	6960-0059		PLUG-HOLE RND-HD FOR .187-D-HOLE NYL	02768	207-120551-00
A36MP8	6960-0059		PLUG-HOLE RND-HD FOR .187-D-HOLE NYL	02768	207-120551-00
A36MP9	6960-0059		PLUG-HOLE RND-HD FOR .187-D-HOLE NYL	02768	207-120551-00
A36MP10	2200-0167	2	SCREW-MACH 4-40 .375-IN-LG 82 DEG	28480	2200-0167
A36MP11	2200-0167		SCREW-MACH 4-40 .375-IN-LG 82 DEG	28480	2200-0167
A36MP12	0624-0227	5	SCREW-TPG 4-40 .25-IN-LG PAN-HD-POZI STL	28480	0624-0227
A36MP13	0624-0227		SCREW-TPG 4-40 .25-IN-LG PAN-HD-POZI STL	28480	0624-0227
A36MP14	0624-0227		SCREW-TPG 4-40 .25-IN-LG PAN-HD-POZI STL	28480	0624-0227
A36MP15	0624-0227		SCREW-TPG 4-40 .25-IN-LG PAN-HD-POZI STL	28480	0624-0227
A36MP16	0624-0227		SCREW-TPG 4-40 .25-IN-LG PAN-HD-POZI STL	28480	0624-0227
A36MP17 THRU A36MP33	0624-0078	17	SCREW-TPG 6-32 .375-IN-LG PAN-HD-POZI	28480	0624-0078
A36A1	08555-60057	1	ASSEMBLY, DISCRIMINATOR	28480	08555-60057
A36A1C1	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A1C2	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C3	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	0420J	150D104X9035A2
A36A1C4	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C5	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C6	0160-3533		CAPACITOR-FXD 470PF +-5% 300VDC MICA0+70	28480	0160-3533
A36A1C7	0160-3533		CAPACITOR-FXD 470PF +-5% 300VDC MICA0+70	28480	0160-3533
A36A1C8	0160-3538	2	CAPACITOR-FXD 750PF +-5% 100VDC MICA0+70	28480	0160-3538
A36A1C9	0160-3538		CAPACITOR-FXD 750PF +-5% 100VDC MICA0+70	28480	0160-3538
A36A1C10	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C11	0160-2221		CAPACITOR-FXD 1300PF +-5% 300VDC	28480	0160-2221
A36A1C12*	0160-2206	1	CAPACITOR-FXD 160PF +-5% 300VDC MICA0+70 *FACTORY SELECTED PART	28480	0160-2206
A36A1C13	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A1C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A1C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A1C17	0160-2453	1	CAPACITOR-FXD .22UF +-10% 80VDC POLYE	28480	0160-2453
A36A1C18	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C19	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1C20	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A1CR1	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A36A1CR2	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A36A1CR3	1902-3104		DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	0203G	SZ 10939-110
A36A1CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A36A1L1	9100-1646	2	COIL-MLD 430UH 5% Q=65 .19DX.44LG	02178	19-1331-26J
A36A1L2	9100-1647	1	COIL-MLD 470UH 5% Q=65 .19DX.44LG	02178	19-1331-27J
A36A1L3	9100-1646		COIL-MLD 430UH 5% Q=65 .19DX.44LG	02178	19-1331-26J
A36A1L4	9100-1644	1	COIL-MLD 330UH 5% Q=65 .19DX.44LG	02178	19-1331-23J
A36A1L5	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A36A1L6	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A36A1L7	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A36A1Q1	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A36A1Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A1Q3	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A1Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A1Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A1Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A36A1Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A36A1Q8	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A36A1Q9	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A36A1Q10	1854-0045	1	TRANSISTOR NPN SI TO-18 PD=500MW	28480	1854-0045
A36A1R1	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	0160G	CB1055
A36A1R2	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4642-F
A36A1R3	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A36A1R4	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A36A1R5	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A36A1R6	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A36A1R7	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A36A1R8	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A36A1R9	0757-0424		RESISTOR 1.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1101-F
A36A1R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A36A1R11	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A36A1R12	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A36A1R13	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R14	0698-3434	9	RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A36A1R15	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R16	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R17	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A36A1R18	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A36A1R19	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A36A1R20	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A36A1R21	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A36A1R22	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A36A1R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A36A1R24	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R25	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A36A1R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A36A1R27	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A36A1R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A36A1R29	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R30	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A36A1R31	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A36A1R32	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A36A1U1	1821-0001	1	TRANSISTOR ARRAY	0192A	CA3046
A36A1U2	1820-0327	1	IC GATE TTL NAND QUAD 2-INP	0223G	7401PC
A36A2	08555-60099	1	ASSEMBLY, VOLTAGE CONTROLLED CRYSTAL OSC (VCXO)	28480	08555-60099
A36A2C1	0160-3094	1	CAPACITOR-FXD .1UF +-10% 100VDC CER	28480	0160-3094
A36A2C2	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A36A2C3	0121-0451	2	CAPACITOR-V TRMR-AIR 1.7-11PF 250V	74970	187-0106-005
A36A2C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A2C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A2C6			NOT ASSIGNED		
A36A2C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A36A2C8*	0140-0199	2	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A36A2C9	0160-2204		*FACTORY SELECTED PART CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A36A2C10	0140-0198		CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A36A2C11	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A2C12	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A2C13	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A36A2C14	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A36A2C15	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A36A2C16	0121-0451		CAPACITOR-V TRMR-AIR 1.7-11PF 250V	74970	187-0106-005
A36A2C17	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A36A2C18*	0160-2202	6	CAPACITOR-FXD 75PF +-5% 300VDC *FACTORY SELECTED PART	28480	0160-2202

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A36A2CR1	0122-0221	4	DIODE-VVC 100PF 10% C4/C25-MIN=2 8VR=30V	0203G	SMV315-221
A36A2CR2	0122-0221		DIODE-VVC 100PF 10% C4/C25-MIN=2 8VR=30V	0203G	SMV315-221
A36A2CR3	0122-0221		DIODE-VVC 100PF 10% C4/C25-MIN=2 8VR=30V	0203G	SMV315-221
A36A2CR4	0122-0221		DIODE-VVC 100PF 10% C4/C25-MIN=2 8VR=30V	0203G	SMV315-221
A36A2CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A36A2CR6	1901-0040		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A36A2CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A36A2CR8	1901-0025	1	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A36A2CR9	1901-0040		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A36A2E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A36A2L1	9100-1656	1	COIL-MLD 1.3MH 5% Q=60 .215DX.56LG	02178	22-1312-22J
A36A2L2	9100-3156	1	COIL-MLD 47UH 5% Q=65 .592LG SRF=9MHZ	K3105	556-7120-34 MODIFIED
A36A2L3	9140-0137	4	COIL-MLD 1MH 5% Q=60 .19DX.44LG SRF=3MHZ	02178	19-1331-35J
A36A2L4	9140-0137		COIL-MLD 1MH 5% Q=60 .19DX.44LG SRF=3MHZ	02178	19-1331-35J
A36A2L5	9140-0137		COIL-MLD 1MH 5% Q=60 .19DX.44LG SRF=3MHZ	02178	19-1331-35J
A36A2L6	9140-0137		COIL-MLD 1MH 5% Q=60 .19DX.44LG SRF=3MHZ	02178	19-1331-35J
A36A2Q1	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A2Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A2Q3	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A36A2Q4	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A36A2Q5	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A36A2Q6	1853-0010	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A36A2Q7	1854-0332	1	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0332
A36A2R1	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A36A2R2	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A36A2R3	0698-3247	1	RESISTOR 4.53K .25% .125W F TC=0+-50	28480	0698-3247
A36A2R4	0698-7828	1	RESISTOR 4.37K .25% .125W F TC=0+-100	0299E	MF52C1/4-T0-4371-C
A36A2R5	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A36A2R6	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A36A2R7	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A36A2R8			NOT ASSIGNED		
A36A2R9	0698-3153	3	RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A36A2R10	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A36A2R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A36A2R12	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A36A2R13			NOT ASSIGNED		
A36A2R14			NOT ASSIGNED		
A36A2R15	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A36A2R16	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A36A2R17	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A36A2R18	0683-1005	1	RESISTOR 10 5% .25W FC TC=-400/+500	0160G	CB1005
A36A2R19	0757-0459		RESISTOR 56.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5622-F
A36A2R20	0698-3408	1	RESISTOR 2.15K 1% .5W F TC=0+-100	0552D	CMF-65-2
A36A2R21	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A36A2R22	0757-0411	1	RESISTOR 332 1% .125W F TC=0+-100	03298	C4-1/8-T0-332R-F
A36A2R23	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A36A2R24	0757-0446		RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A36A2R25	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A36A2R26*	0698-3156	18	RESISTOR 14.7K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-1472-F
A36A2R27	2100-2650	1	RESISTOR-TRMR 200K 10% C TOP-ADJ 1-TRN	73138	62-214-1
A36A2RT1	0837-0075	1	THERMISTOR DISC 500-OHM TC=3.9%/C-DEG	15454	2DB501 10%
A36A2U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A36A2W1	08565-60018	1	CABLE ASSEMBLY, PULSE AMPLIFIER	28480	08565-60018
A36A2XY1	1200-0770	1	SOCKET-XTAL 2-CONT HC-6/U DIP-SLDR	28480	1200-0770
A36A2Y1	0410-0013	1	CRYSTAL:QUARTZ 1MHZ	28480	0410-0013
A36A3	5086-7162	1	ASSEMBLY, SAMPLER	28480	5086-7162
A37	08565-60011	1	ASSEMBLY, THIRD CONVERTER	28480	08565-60011
A37C1	08565-20062	6	TUNING SCREW	28480	08565-20062
A37C2	08565-20062		TUNING SCREW	28480	08565-20062
A37C3	08565-20062		TUNING SCREW	28480	08565-20062
A37C4	08565-20062		TUNING SCREW	28480	08565-20062
A37C5	08565-20062		TUNING SCREW	28480	08565-20062
A37C6	08565-20062		TUNING SCREW	28480	08565-20062
A37C7	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A37C8	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A37C9	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A37C10	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A37C11	0160-2437		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-2437
A37C12	0140-0076	1	CAPACITOR-FDTHRU 330PF 10% 500V MICA	0456C	666-053-01A0-331K
A37E1	9170-0029		CORE-SHIELDING BEAD		
A37E2	08565-20063	6	CONTACT, FILTER	0188G	56-590-65A2/4A
A37E3	08565-20063		CONTACT, FILTER	28480	08565-20063
A37E4	08565-20063		CONTACT, FILTER	28480	08565-20063
A37E5	08565-20063		CONTACT, FILTER	28480	08565-20063
				28480	08565-20063
A37E6	08565-20063		CONTACT, FILTER		
A37E7	08565-20063		CONTACT, FILTER	28480	08565-20063
				28480	08565-20063
A37J1	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
A37J2	1250-1435		CONNECTOR,RF 50-OHM SMC JACK	2493A	A-1250-1435-1
A37J3	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
A37J4	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
A37J5	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	0576I	50-045-4610
A37L1	08565-60057	6	COIL/FILTER ASSEMBLY	28480	08565-60057
A37L2	08565-60057		COIL/FILTER ASSEMBLY	28480	08565-60057
A37L3	08565-60057		COIL/FILTER ASSEMBLY	28480	08565-60057
A37L4	08565-60057		COIL/FILTER ASSEMBLY	28480	08565-60057
A37L5	08565-60057		COIL/FILTER ASSEMBLY	28480	08565-60057
A37L6	08565-60057		COIL/FILTER ASSEMBLY	28480	08565-60057
A37MP1	08565-20011	1	HOUSING, THIRD CONVERTER	28480	08565-20011
A37MP2	08565-00063	1	GASKET, THIRD CONVERTER	28480	08565-00063
A37MP3	08565-00014	1	COVER, THIRD CONVERTER	28480	08565-00014
A37MP4	2950-0078		NUT-HEX-DBL-CHAM 10-32-THD .067-IN-THK	0331F	MN100-11
A37MP5	3050-0022	6	WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP6	3050-0022		WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP7	3050-0022		WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP8	3050-0022		WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP9	3050-0022		WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP10	3050-0022		WASHER-FL MTLC 5/16 IN .318-IN-ID	28480	3050-0022
A37MP11	2950-0007	6	NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP12	2950-0007		NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP13	2950-0007		NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP14	2950-0007		NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP15	2950-0007		NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP16	2950-0007		NUT-HEX-DBL-CHAM 5/16-32-THD .094-IN-THK	0460D	9001
A37MP17	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP18	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP19	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP20	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP21	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP22	2260-0002		NUT-HEX-DBL-CHAM 4-40-THD .062-IN-THK	28480	2260-0002
A37MP23	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A37MP24	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A37MP25	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A37MP26	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A37MP27	2190-0124		WASHER-LK INTL T NO. 10 .195-IN-ID	0331F	LW101-30
A37MP28 THRU A37MP71	2200-0103		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
	0360-0042	2	TERMINAL-SLDR LUG PL-MTG FOR-#6-SCR	28480	0360-0042
	0890-0098	1	TUBING-FLEX .032-ID TFE .016-WALL	09795	I-SW
A37A1	08565-60014	1	ASSEMBLY, THIRD CONVERTER AMPLIFIER	28480	08565-60014
A37A1C1	0160-3873	2	CAPACITOR-FXD 4.7PF +-.5PF 200VDC	28480	0160-3873
A37A1C2	0160-3878	5	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A37A1C3			NOT ASSIGNED		
A37A1C4	0160-3879		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A37A1C5	0160-3878		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A37A1C6	0160-3873		CAPACITOR-FXD 4.7PF +-.5PF 200VDC	28480	0160-3873
A37A1L1	9100-0346	1	COIL-MLD 50NH 20% Q=40 .095DX.25LG	28480	9100-0346
A37A1MP1	1200-0172	1	INSULATOR-XSTR DAP-GL	28480	1200-0172
A37A1Q1	5086-4218		TC21 IN TO-72 PKG	28480	5086-4218
A37A1Q2	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A37A1R1	0698-3449		RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
A37A1R2	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A37A1R3	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A37A1R4	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A37A1R5	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A37A2	08565-60013	1	ASSEMBLY, THIRD CONVERTER MIXER	28480	08565-60013

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A37A2C1	0160-3890	1	CAPACITOR-FXD 68PF +-10% 100VDC CER0+-30	28480	0160-3890
A37A2CR1	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A37A2CR2	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A37A2L1	9100-2259	1	COIL-MLD 1.5UH 10% Q=32 .095DX.25LG	02178	09-4436-2K
A37A2L2	9100-2255		COIL-MLD 470NH 10% Q=35 .095DX.25LG	02178	09-4426-2K
A37A2L3	9100-2251	2	COIL-MLD 220NH 10% Q=32 .095DX.25LG	02178	09-4416-5K
A37A3	08565-60012	1	ASSEMBLY, THIRD CONVERTER OSCILLATOR	28480	08565-60012
A37A3C1	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C2	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C3	0160-3878		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A37A3C4	0160-3875		CAPACITOR-FXD 22PF +-5% 200VDC CER0+-30	28480	0160-3875
A37A3C5	0160-4516	1	CAPACITOR-FXD 15PF +-5% 200VDC CER0+-30	28480	0160-4516
A37A3C6	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C7	0160-3878		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A37A3C8	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C9	0160-3878		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A37A3C10	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C11	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C12	0160-3876	1	CAPACITOR-FXD 47PF +-20% 200VDC CER	28480	0160-3876
A37A3C13	0160-2265	1	CAPACITOR-FXD 22PF +-5% 500VDC CER0+-30	28480	0160-2265
A37A3C14	0160-2249	1	CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A37A3C15	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C16	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A37A3C18	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C19	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C20	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A37A3C22	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C23	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A37A3C24	0160-2263	2	CAPACITOR-FXD 18PF +-5% 500VDC CER0+-30	28480	0160-2263
A37A3C25	0160-2263		CAPACITOR-FXD 18PF +-5% 500VDC CER0+-30	28480	0160-2263
A37A3C26	0160-2266	1	CAPACITOR-FXD 24PF +-5% 500VDC CER0+-30	28480	0160-2266
A37A3C27	0160-2264		CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A37A3CR1	1901-0639		DIODE-PIN 110V	28480	5082-3080
A37A3CR2	1901-0639		DIODE-PIN 110V	28480	5082-3080
A37A3CR3	1901-0639		DIODE-PIN 110V	28480	5082-3080
A37A3CR4	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A37A3CR5	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A37A3L1	9140-0158		COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A37A3L2	9100-2247		COIL-MLD 100NH 10% Q=34 .095DX.25LG	02178	09-4416-1K
A37A3L3	9140-0158		COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A37A3L4	08565-80001	1	COIL, 150 NH	28480	08565-80001
A37A3L5	9140-0158		COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A37A3L6	9140-0144		COIL-MLD 4.7UH 10% Q=45 .095DX.25LG	02178	09-4436-8K
A37A3L7	9140-0158		COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A37A3L8	9100-2251		COIL-MLD 220NH 10% Q=32 .095DX.25LG	02178	09-4416-5K
A37A3L9	9140-0144		COIL-MLD 4.7UH 10% Q=45 .095DX.25LG	02178	09-4436-8K
A37A3L10	9140-0144		COIL-MLD 4.7UH 10% Q=45 .095DX.25LG	02178	09-4436-8K
A37A3L11	9100-2247		COIL-MLD 100NH 10% Q=34 .095DX.25LG	02178	09-4416-1K
A37A3L12	9100-2247		COIL-MLD 100NH 10% Q=34 .095DX.25LG	02178	09-4416-1K
A37A3MP1	1200-0173	1	INSULATOR-XSTR DAP-GL	28480	1200-0173
A37A3Q1	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A37A3Q2	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	0203G	2N5179
A37A3Q3	1854-0247		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A37A3Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A37A3R1	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A37A3R2	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A37A3R3	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A37A3R4	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A37A3R5	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A37A3R6	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A37A3R7	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A37A3R8	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A37A3R9	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A37A3R10	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A37A3R11	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A37A3R12	0698-3429	1	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A37A3R13	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A37A3R14	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A37A3R15	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A37A3R16	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A37A3R17	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A37A3R18	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A37A3R19	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A37A3R20	0698-3433		RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A37A3R21	0757-0276	1	RESISTOR 61.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A37A3R22	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A37A3R23	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A37A3R24	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A37A3R25	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A37A3R26	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A37A3R27	2100-1772	1	RESISTOR-TRMR 500 5% WW TOP-ADJ 1-TRN	03740	3345P-W50-501
A37A3R28	0698-4037	1	RESISTOR 46.4 1% .125W F TC=0+-100	03298	C4-1/8-T0-46R4-F
A37A3U1	1858-0004	1	TRANSISTOR ARRAY	0192A	CA3049
A37A3Y1	0410-1023	1	CRYSTAL, 99.333 MHZ	28480	0410-1023
A37A3Y2	0410-1024	1	CRYSTAL, 100.000 MHZ	28480	0410-1024
A37A3Y3	0410-1025	1	CRYSTAL, 100.667 MHZ	28480	0410-1025
A38	08565-60037	1	ASSEMBLY, READOUT INPUT	28480	08565-60037
A38C1	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A38C2	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A38C3			NOT ASSIGNED		
A38C4	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X902082
A38C5	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X901082
A38CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A38CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A38J1	1251-4736		CONNECTOR 26-PIN M RECTANGULAR	76381	3493-2003
A38J2	1251-4736		CONNECTOR 26-PIN M RECTANGULAR	76381	3493-2003
A38J3	1251-4737	1	CONNECTOR 50-PIN M RECTANGULAR	76381	3496-2003
A38L1	9100-2833		COIL 30UH 5% Q=70 .25DX1LG SRF=20MHZ	28480	9100-2833
A38R1	0757-0470		RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A38R2	0757-0470		RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A38R3	0757-0470		RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A38R4	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A38R5	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A38R6	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A38R7	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A38R8	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A38R9	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A38R10	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A38R11	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A38R12	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A38R13	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R14	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R15	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R16	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R17	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R18	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R19	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R20	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A38R21	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A38R22	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R23	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R24	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A38R25	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A38R26	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A38R27	0698-3457		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A38R28	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R29	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R30	0698-3243		RESISTOR 178K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1783-F
A38R31	0698-3455		RESISTOR 261K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2613-F
A38R32	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R33	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R34	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R35	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R36	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R37	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R38	0757-0470		RESISTOR 162K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1623-F
A38R39	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A38R40	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A38R41	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R42	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R43	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R44	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R45	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R46	0698-3458		RESISTOR 348K 1% .125W F TC=0+-100	28480	0698-3458
A38R47	0698-3451		RESISTOR 133K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1333-F
A38R48	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A38R49	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38R50	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A38R51	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A38R52	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A38U1	1820-1635	7	IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U2	1820-1908	2	IC GATE CMOS EXCL-OR QUAD 2-INP	02036	MC14070BCL
A38U3	1820-1592		IC INV CMOS HEX 1-INP	02036	MC14069BCL
A38U4	1810-0208		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R68K
A38U5	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U6	1820-1592		IC INV CMOS HEX 1-INP	02036	MC14069BCL
A38U7	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U8	1810-0208		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R68K
A38U9	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U10	1810-0208		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R68K
A38U11	1820-1907	1	IC GATE CMOS EXCL-NOR QUAD 2-INP	02036	MC14077BCL
A38U12	1810-0208		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R68K
A38U13	1810-0205		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R4.7K
A38U14	1820-1909	2	IC GATE CMOS OR TPL 3-INP	02036	MC14075BCL
A38U15	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U16	1820-1525	1	IC ADDR CMOS FULL ADDER 4-BIT	02036	MC14008CL
A38U17	1820-1550		IC GATE CMOS OR QUAD 2-INP	02036	MC14071BCL
A38U18	1820-1908		IC GATE CMOS EXCL-OR QUAD 2-INP	02036	MC14070BCL
A38U19	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U20	1810-0208		NETWORK-RES 8-PIN-8IP .1-PIN-8PCG	0248C	750-81-R68K
A38U21	1820-1635		IC INV CMOS HEX 1-INP	02036	MC14502AL
A38U22	1820-1910	1	IC GATE CMOS AND TPL 3-INP	02036	MC14073BCL
A38U23	1820-1909		IC GATE CMOS OR TPL 3-INP	02036	MC14075BCL
A38VR1	1902-3036		DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	02036	BZ 10939-38
A39	08565-60036	1	ASSEMBLY, READOUT DRIVER	28480	08565-60036
A39C1	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	0420J	150D227X9010B2
A39C2	0160-0155		CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	0420J	292P33292
A39C3	0180-2374	1	CAPACITOR-FXD 100UF+-10% 20VDC TA	0420J	150D107X9020X2
A39C4	0160-0162		CAPACITOR-FXD .022UF +-10% 200VDC POLYE	0420J	292P22392
A39C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A39C6	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A39CR1	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A39E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A39J1			NOT ASSIGNED		
A39J2	1200-0507		SOCKET-IC 16-CONT DIP-SLDR	06776	0-002811
A39Q1	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q2	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q3	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q4	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q5	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q6	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q7	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39Q8	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02236	2N2222A
A39R1	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R2	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A39R3	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A39R4	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A39R5	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A39R6	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A39R7	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A39R8	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A39R9	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A39R10	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A39R11	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R12	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A39R13	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A39R14	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A39R15	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A39R16	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A39R17	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A39R18	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A39R19	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A39R20	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A39R21	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A39R22	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A39R23	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A39R24	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A39R25	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A39R26	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A39R27	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R28	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R29	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R30	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R31	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R32	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R33	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R34	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R35	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A39R36	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A39R37	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A39R38	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R40	2100-3355		RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	73138	72-150-0
A39R41	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A39R42	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A39R43	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A39R44	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A39R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R46	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A39R47	0757-0382	1	RESISTOR 16.2 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-16R2-F
A39R48	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A39R49	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R50	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R51	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R52	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R53	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R54	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R55	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R56	0698-3434		RESISTOR 34.8 1% .125W F TC=0+-100	03298	C4-1/8-T0-34R8-F
A39R57	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R58	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A39R59	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A39R60	0757-0461		RESISTOR 68.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6812-F
A39R61	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A39U1	1810-0204		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R1K
A39U2	1820-1443		IC CNTR TTL LS BIN ASYNCHRO	0169M	SN74LS293N
A39U3	1820-1203	1	IC GATE TTL LS AND TPL 3-INP	0223G	9LS11PC
A39U4	1820-1201	1	IC GATE TTL LS AND QUAD 2-INP	0169M	SN74LS08N
A39U5	1820-1422	1	IC MV TTL LS MONOSTBL RETRIG	0169M	SN74LS122N
A39U6	1818-0321	1		28480	1818-0321
A39U7	1820-1216		IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N
A39U8	1820-1216		IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N
A39U9	1820-0471		IC INV TTL HEX 1-INP	0223G	7406PC
A39U10	1820-1144		IC GATE TTL LS NOR QUAD 2-INP	0223G	9LS02PC
A39U11	1820-0471		IC INV TTL HEX 1-INP	0223G	7406PC
A39U12	1820-0471		IC INV TTL HEX 1-INP	0223G	7406PC
A39U13	1820-1200		IC INV TTL LS HEX 1-INP	0169M	SN74LS05N
A39U14	1820-1200		IC INV TTL LS HEX 1-INP	0169M	SN74LS05N
A39U15	1810-0205		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A39U16	1810-0205		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A39U17	1810-0204		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R1K
A39U18	1810-0204		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R1K
A39U19	1858-0023	1	TRANSISTOR ARRAY	0192A	CA3081
A39U20	1858-0057		TRANSISTOR ARRAY 16-PIN PL8TC DIP	0192A	CA3082F
A39U21	1820-1198		IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74LS03N
A39U22	1858-0057		TRANSISTOR ARRAY 16-PIN PL8TC DIP	0192A	CA3082F
A39U23	1820-1740		IC DRVR MOS* D8PL DRVR	0340F	D8A863N
A39U24	1820-1740		IC DRVR MOS* D8PL DRVR	0340F	D8A863N
A39U25	1820-1740		IC DRVR MOS* D8PL DRVR	0340F	D8A863N
A39U26	1810-0208		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R68K
A39U27	1810-0208		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R68K
A39U28	1810-0208		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R68K

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A39VR1	1902-3024	1	DIODE-ZNR 2.87V 5% DO-7 PD=.4W TC=-.07%	0203G	BZ 10939-26
A40	08565-60048	1	ASSEMBLY, POWER SUPPLY	28480	08565-60048
A40MP1	08565-00025	1	CHASSIS, POWER SUPPLY	28480	08565-00025
A40MP2	08565-00026	1	BRACKET, POWER CAP	28480	08565-00026
A40MP3	2420-0002	1	NUT-HEX-DBL-CHAM 6-32-THD .109-IN-THK	28480	2420-0002
A40MP4	2360-0194	1	SCREW-MACH 6-32 .312-IN-LG 100 DEG	28480	2360-0194
A40MP5	0360-0269	1	TERMINAL-SLDR LUG LK-MTG FOR-#8-SCR	78189	2103-08-00
A40A1	08565-60030	1	ASSEMBLY, RECTIFIER	28480	08565-60030
A40A1C1	0160-4256	7	CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1C2	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1C3	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1C4	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1C5	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A1C7	0180-2736	1	CAPACITOR-FXD .015F+75-10% 15VDC AL	28480	0180-2736
A40A1C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A1C9	0180-2738	3	CAPACITOR-FXD 5800UF+75-10% 40VDC AL	28480	0180-2738
A40A1C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A1C11	0180-2738		CAPACITOR-FXD 5800UF+75-10% 40VDC AL	28480	0180-2738
A40A1C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A1C13	0180-2738		CAPACITOR-FXD 5800UF+75-10% 40VDC AL	28480	0180-2738
A40A1C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A1C15	0180-2737	1	CAPACITOR-FXD 2800UF+75-10% 75VDC AL	28480	0180-2737
A40A1C16	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A40A1C17	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A1CR1	1901-0662	18	DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR2	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR3	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR4	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR5	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR6	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR7	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR8	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR9	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR10	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR11	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR12	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR13	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR14	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR15	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR16	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR17	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1CR18	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A40A1J1	1251-4739	1	CONNECTOR 17-PIN M POST TYPE	27264	22-11-2181
A40A1MP1	0360-0353	4	TERMINAL-SLDR LUG EYLT-MTG FOR-#6-SCR	79963	176
A40A1MP2	0360-0353		TERMINAL-SLDR LUG EYLT-MTG FOR-#6-SCR	79963	176
A40A1MP3	0360-0353		TERMINAL-SLDR LUG EYLT-MTG FOR-#6-SCR	79963	176
A40A1MP4	0360-0353		TERMINAL-SLDR LUG EYLT-MTG FOR-#6-SCR	79963	176
A40A1MP5	0361-0021	4	RIVET;SEMITUBULAR, OVAL HEAD	28480	0361-0021
A40A1MP6	0361-0021		RIVET;SEMITUBULAR, OVAL HEAD	28480	0361-0021
A40A1MP7	0361-0021		RIVET;SEMITUBULAR, OVAL HEAD	28480	0361-0021
A40A1MP8	0361-0021		RIVET;SEMITUBULAR, OVAL HEAD	28480	0361-0021
A40A1MP9	2190-0011	10	WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP10	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP11	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP12	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP13	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP14	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP15	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP16	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP17	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP18	2190-0011		WASHER-LK INTL T NO. 10 .195-IN-ID	0G791	1022
A40A1MP19	2680-0099	10	SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP20	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP21	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP22	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP23	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP24	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP25	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP26	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP27	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099
A40A1MP28	2680-0099		SCREW-MACH 10-32 .375-IN-LG PAN-HD-POZI	28480	2680-0099

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A40A1Q1	1884-0261	9	THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A1R1	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-1001-F
A40A1R2	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A40A1R3	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A40A1R4	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	0329B	C4-1/8-T0-3161-F
A40A1R5	0757-0833	1	RESISTOR 5.11K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-5111-F
A40A1R6	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	0329B	C4-1/8-T0-101-F
A40A1VR1	1902-0197		DIODE-ZNR 82.5V 5% DO-15 PD=1W TC=+.082%	28480	1902-0197
A40A1XA2	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	0450G	252-15-30-300
A40A2	08565-60031	1	ASSEMBLY, REGULATOR	28480	08565-60031
A40A2C1	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	0420J	150D685X9035B2
A40A2C2	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A40A2C3	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A40A2C4	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A40A2C5	0180-2182		CAPACITOR-FXD 18UF+-10% 50VDC TA	0420J	150D186X9050R2
A40A2C6	0160-0168		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	292P10492
A40A2C7	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A40A2C8	0160-4204	2	CAPACITOR-FXD .033UF +-10% 500VDC CER	0439C	30N-500-X7R-333K
A40A2C9	0160-0168		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	292P10492
A40A2C10	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A40A2C11	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A40A2C12	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A40A2C13	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A40A2C14	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	0420J	150D685X9035B2
A40A2C15	0180-1866	1	CAPACITOR-FXD 500UF+75-10% 75VDC AL	0420J	39D507G075HL4
A40A2C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A2C17	0160-4256		CAPACITOR-FXD .047UF +-20% 200VDC CER	0456C	8131-200-X7R-473M
A40A2C18	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A40A2C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A40A2C20	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A40A2C21	0160-4204		CAPACITOR-FXD .033UF +-10% 500VDC CER	0439C	30N-500-X7R-333K
A40A2C22	0180-1826	1	CAPACITOR-FXD 100UF+50-10% 250VDC AL	0420J	39D107F250HL4
A40A2CR1			NOT ASSIGNED		
A40A2CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR3			NOT ASSIGNED		
A40A2CR4	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR5			NOT ASSIGNED		
A40A2CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR7	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR8			NOT ASSIGNED		
A40A2CR9	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR10			NOT ASSIGNED		
A40A2CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR13			NOT ASSIGNED		
A40A2CR14	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR15			NOT ASSIGNED		
A40A2CR16	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR17	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR18			NOT ASSIGNED		
A40A2CR19	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR20			NOT ASSIGNED		
A40A2CR21	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR22	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR23	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR24	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR25			NOT ASSIGNED		
A40A2CR26	1906-0094	2	DIODE-FW BRDG 400V 1.5A	0271C	KBP04
A40A2CR27	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR28	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR29			NOT ASSIGNED		
A40A2CR30	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR31			NOT ASSIGNED		
A40A2CR32	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR33			NOT ASSIGNED		
A40A2CR34	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR35			NOT ASSIGNED		
A40A2CR36	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR37			NOT ASSIGNED		
A40A2CR38	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR39			NOT ASSIGNED		
A40A2CR40	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A40A2CR41			NOT ASSIGNED		
A40A2CR42	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	0203G	SR1358-4
A40A2CR43	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A40A2CR44	1906-0094		DIODE-FW BRDG 400V 1.5A	0271C	KBP04
A40A2DS1	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS2	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS3	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS4	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS5	1990-0486	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0486
A40A2DS6	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS7	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS8	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2DS9	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A40A2F1	2110-0002	1	FUSE 2A 250V FAST-BLO 1.25X.25 UL IEC	0470C	312002.
A40A2F2	2110-0001		FUSE 1A 250V FAST-BLO 1.25X.25 UL IEC	0470C	312001.
A40A2F3	2110-0043	3	FUSE 1.5A 250V FAST-BLO 1.25X.25 UL IEC	0470C	31201.5
A40A2F4	2110-0043		FUSE 1.5A 250V FAST-BLO 1.25X.25 UL IEC	0470C	31201.5
A40A2F5	2110-0043		FUSE 1.5A 250V FAST-BLO 1.25X.25 UL IEC	0470C	31201.5
A40A2F6	2110-0004	2	FUSE .25A 250V FAST-BLO 1.25X.25 UL IEC	0470C	312.250
A40A2F7	2110-0004		FUSE .25A 250V FAST-BLO 1.25X.25 UL IEC	0470C	312.250
A40A2J1	1251-4187	1	CONNECTOR 9-PIN M POST TYPE	27264	22-11-2101
A40A2J2	1251-4740	1	CONNECTOR 14-PIN M POST TYPE	27264	22-11-2151
A40A2MP1	08565-00030	1	HEAT SINK, TRANSISTOR	28480	08565-00030
	6040-0239		GREASE:SILICONE COMPOUND	99700	120-5GM
A40A2MP2	1400-0493	2	CABLE TIE .062-1.25-DIA .14-WD NYL	59730	TY8-24M-8
A40A2MP3	1400-0493		CABLE TIE .062-1.25-DIA .14-WD NYL	59730	TY8-24M-8
A40A2MP4	1200-0043		INSULATOR-XSTR ALUMINUM (FOR Q1 THRU Q4)	04738	322047
A40A2MP5	1200-0043		INSULATOR-XSTR ALUMINUM	04738	322047
A40A2MP6	1200-0043		INSULATOR-XSTR ALUMINUM	04738	322047
A40A2MP7	1200-0043		INSULATOR-XSTR ALUMINUM	04738	322047
A40A2MP8	0340-0416	5	INSULATOR-XSTR THERMA-FILM	0260H	43-66-1
A40A2MP9	0340-0416		INSULATOR-XSTR THERMA-FILM (FOR Q15 THRU Q19)	0260H	43-66-1
A40A2MP10	0340-0416		INSULATOR-XSTR THERMA-FILM	0260H	43-66-1
A40A2MP11	0340-0416		INSULATOR-XSTR THERMA-FILM	0260H	43-66-1
A40A2MP12	0340-0416		INSULATOR-XSTR THERMA-FILM	0260H	43-66-1
A40A2MP13 THRU A40A2MP30	4330-0145	18	INSULATOR-BEAD GLASS	28480	4330-0145
A40A2MP31 THRU A40A2MP49	2200-0145	18	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0145
A40A2MP50 THRU A40A2MP67	2190-0004	18	WASHER-LK INTL T NO. 6 .115-IN-ID	0G791	41A-8C EVERLOCK WASHER
A40A2MP68 THRU A40A2MP85	1200-0081		INSULATOR-BSHG-FLG NYLON	28480	1200-0081
A40A2MP86 THRU A40A2MP99	2110-0269		FUSEHOLDER-CLIP TYPE .25D-FUSE	28480	2110-0269
A40A2Q1	1854-0611	3	TRANSISTOR NPN 2N6055 SI DARL TO-3	0203G	2N6055
A40A2Q2	1854-0774	1	TRANSISTOR NPN 2N6056 SI DARL TO-3	0203G	2N6056
A40A2Q3	1854-0611		TRANSISTOR NPN 2N6055 SI DARL TO-3	0203G	2N6055
A40A2Q4	1854-0611		TRANSISTOR NPN 2N6055 SI DARL TO-3	0203G	2N6055
A40A2Q5	1854-0072	2	TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	0192A	2N3054
A40A2Q6	1853-0052	1	TRANSISTOR PNP 2N3740 SI TO-66 PD=25W	0203G	2N3740
A40A2Q7	1854-0072		TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	0192A	2N3054
A40A2Q8	1854-0324	2	TRANSISTOR NPN 2N3739 SI TO-66 PD=20W	0203G	2N3739
A40A2Q9	1854-0324		TRANSISTOR NPN 2N3739 SI TO-66 PD=20W	0203G	2N3739
A40A2Q10	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q12	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A40A2Q13	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q15	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q17	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q19	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q21	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q22	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	0203G	2N3251
A40A2Q23	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q25	1884-0261		THYRISTOR-SCR TO-220AB VRRM=100	28480	1884-0261
A40A2Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A40A2Q27	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A40A2Q28	1854-0234		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	0192A	2N3440
A40A2Q29	1854-0234		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	0192A	2N3440
A40A2Q30	1884-0009	1	THYRISTOR-SCR TO-5 VRRM=200	03508	C6B

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A40A2Q31	1853-0221	1	TRANSISTOR PNP 2N5416 SI TO-5 PD=1W	01924	2N5416
A40A2R1 THRU A40A2R6			NOT ASSIGNED		
A40A2R7	0698-3236	7	RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R8	0698-3237		RESISTOR 5K .25% .125W F TC=0+-50	28480	0698-3237
A40A2R9	0811-1673	1	RESISTOR 3.9 5% 2W PW TC=0+-400	04678	BWW2-3R9-J
A40A2R10	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A40A2R11	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A40A2R12	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A40A2R13	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R14	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A40A2R15	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A40A2R16	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A40A2R17	2100-1774	1	RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	03740	33A5P-W50-202
A40A2R18	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A40A2R19	0811-1661	2	RESISTOR .39 5% 2W PW TC=0+-800	04678	BWW2-39/100-J
A40A2R20	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A40A2R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R22	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A40A2R23	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R24	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R25	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R26	0811-1661		RESISTOR .39 5% 2W PW TC=0+-800	04678	BWW2-39/100-J
A40A2R27	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A40A2R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R29	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A40A2R30	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R31	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R32	0698-7421		RESISTOR 40K .25% .125W F TC=0+-100	02992	MF4C1/8-T0-4002-C
A40A2R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A40A2R34	0698-3159		RESISTOR 26.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2612-F
A40A2R35	0811-1666	1	RESISTOR 1 5% 2W PW TC=0+-800	04678	BWW2-1R0-J
A40A2R36	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A40A2R37	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A40A2R38	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A40A2R39	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A40A2R40	0757-0367	1	RESISTOR 100K 1% .5W F TC=0+-100	02992	MF7C1/2-T0-1003-F
A40A2R41	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	03298	C4-1/8-T0-121R-F
A40A2R42	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A40A2R43	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A40A2R44	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R45	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A40A2R46	0698-7796	1	RESISTOR 14.7K .25% .125W F TC=0+-100	02992	MF4C1/8-T0-1472-C
A40A2R47	0811-2823	2	RESISTOR 7.5 5% .75W PW TC=0+-50	05520	RBJ/2-T2-7R5-J
A40A2R48	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A40A2R49	0698-4519	1	RESISTOR 140K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1403-F
A40A2R50	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A40A2R51	0757-0853	1	RESISTOR 51.1K 1% .5W F TC=0+-100	02992	MF7C1/2-T0-5112-F
A40A2R52	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R53			NOT ASSIGNED		
A40A2R54	0698-7794		RESISTOR 10K .25% .125W F TC=0+-100	02992	MF4C1/8-T0-1002-C
A40A2R55	0698-8417	1	RESISTOR 5.3K .25% .125W F TC=0+-50	02992	MF4C1/8-T2-5301-C
A40A2R56	0812-0066	1	RESISTOR .33 5% 2W PW TC=0+-800	04678	BWW2-33/100-J
A40A2R57	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A40A2R58	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R59	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A40A2R60	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R61	0698-3237		RESISTOR 5K .25% .125W F TC=0+-50	28480	0698-3237
A40A2R62	0698-7794		RESISTOR 10K .25% .125W F TC=0+-100	02992	MF4C1/8-T0-1002-C
A40A2R63	0811-2823		RESISTOR 7.5 5% .75W PW TC=0+-50	05520	RBJ/2-T2-7R5-J
A40A2R64	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A40A2R65	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R66	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A40A2R67	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R68	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R69	0698-7794		RESISTOR 10K .25% .125W F TC=0+-100	02992	MF4C1/8-T0-1002-C
A40A2R70	0811-1671	1	RESISTOR 2.7 5% 2W PW TC=0+-400	04678	BWW2-2R7-J
A40A2R71	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A40A2R72	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R73	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A40A2R74	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A40A2R75	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R76	0698-3236		RESISTOR 15K .25% .125W F TC=0+-50	28480	0698-3236
A40A2R77	0811-1675	1	RESISTOR 5.6 5% 2W PW TC=0+-400	04678	BWW2-5R6-J
A40A2R78	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A40A2R79	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A40A2R80	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A40A2R81	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A40A2R82	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A40A2R83	0698-3452		RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A40A2R84	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A40A2R85	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A40A2R86	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A40A2U1	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U2	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U3	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U4	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U5	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U6	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U7	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U8	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U9	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2U10	1826-0261		IC 741 OP AMP	28480	1826-0261
A40A2VR1	1902-3256		DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	0223G	FZ7296
A40A2VR2	1902-3171		DIODE-ZNR 11V 5% DO-7 PD=.4W TC=+.062%	0223G	FZ7264
A40A2VR3	1902-0680		DIODE-ZNR 1N827 6.2V 5% DO-7 PD=.25W	0199A	1N827
A40A2VR4	1902-3224	2	DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.067%	0223G	FZ7284
A40A2VR5	1902-3224		DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.067%	0223G	FZ7284
A40A2VR6	1902-0244	2	DIODE-ZNR 30.1V 5% DO-15 PD=1W TC=+.075%	28480	1902-0244
A40A2VR7	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A40A2VR8	1902-3333		DIODE-ZNR 46.4V 5% DO-7 PD=.4W TC=+.081%	0203G	SZ 10939-374
A40A2VR9	1902-3382	1	DIODE-ZNR 68.1V 2% DO-7 PD=.4W TC=+.079%	0203G	SZ 10939-423
A40A2VR10	1902-0683	1	DIODE-ZNR 100V 2% DO-15 PD=1W TC=+.083%	28480	1902-0683
A40A2VR11	1902-0049	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	0223G	FZ7240
A40A2VR12	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268
A40A2VR13	1902-3182		DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	0223G	FZ7268
A40A2VR14	1902-0244		DIODE-ZNR 30.1V 5% DO-15 PD=1W TC=+.075%	28480	1902-0244
A40A2VR15	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	0223G	FZ7260
A40A2VR16	1902-3301	1	DIODE-ZNR 34.8V 5% DO-7 PD=.4W TC=+.078%	0223G	FZ7312
A40A2VR17	1902-3070	1	DIODE-ZNR 4.22V 5% DO-7 PD=.4W TC=-.038%	0203G	SZ 10939-74
A41	08565-60072	1	ASSEMBLY, POWER CABLE	28480	08565-60072
A41C1	0160-2636	2	CAPACITOR-FXD 470PF +-20% 3KVDC CER	28480	0160-2636
A41C2	0160-2636		CAPACITOR-FXD 470PF +-20% 3KVDC CER	28480	0160-2636
A41C3	0160-4065	1	CAPACITOR-FXD .1UF +-20% 250VAC(RMS)	28480	0160-4065
A41E1	0890-0096	1	TUBING-FLEX .04-ID TFE .016-WALL	09795	T-8W
A41E2	0890-0291	1	TUBING-H8 .375-D/.187-RCVD .025-WALL	28480	0890-0291
A41E3	0890-0301	1	TUBING-H8 .75-D/.375-RCVD .03-WALL POLYO	0214E	RNF-100-3/4-BLK
A41E4	0890-0983	1	TUBING-H8 .125-D/.062-RCVD .02-WALL	0214E	RNF-100-1/8-BLK
A41E5	8090-0402	1	SOLDER-H8 PVF CLR INSUL .28/.3-ID .75-LG	0214E	C-142-52
A41F1	2110-0083	1	FUSE 2.5A 250V FAST-BLO 1.25X.25 UL IEC (FOR 115V OPERATION)	0470C	312.5
A41F1	2110-0094	1	FUSE 1.25A 250V FAST-BLO 1.25X.25 UL IEC (FOR 230V OPERATION)	0470C	312 1.25
A41FL1	0960-0448	1	LINE MODULE FILTER	28480	0960-0448
A41S1	3101-2025	1	SWITCH-RKR SUBMIN DPDT N8 2A 250VAC	28480	3101-2025

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS MOUNTED PARTS		
AT1	0960-0084	1	ISOLATOR, 2.05-4.1 GHZ	28480	0960-0084
AT2	0960-0472	1	ISOLATOR, 2.00-4.45 GHZ	28480	0960-0472
AT3	08565-60090	1	ATTENUATOR, COAX 3DB	28480	08565-60090
AT4	08565-60085	1	ATTENUATOR, COAX 6DB	28480	08565-60085
AT5	11593A	2	TERMINATION, 50 OHM	28480	11593A
AT6	11593A		TERMINATION, 50 OHM	28480	11593A
B1	3160-0252	1	FAN-TBAX 90-CFM 115V 50/60-HZ 1.5-THK	28480	3160-0252
B1	3160-0087	1	FAN-TBAX 95-CFM 115V 50/60/400-HZ (OPTION 400)	28480	3160-0087
C1	0160-4082	4	CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
C2	0160-4082		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
C3	0160-4082		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
C4	0160-4082		CAPACITOR-FDTHRU 1000PF 20% 200V CER	28480	0160-4082
C5	0170-0073	1	CAPACITOR-FXD 1UF +-10% 600VDC POLYE (OPTION 400)	28480	0170-0073
E1	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
F1			SEE A41F1		
F2	2110-0423	1	FUSE 1.5A 125V SLO-BLO .281X.093	0470C	27501.5
FL1			SEE A41FL1		
FL2					
FL3	0960-0085	1	FILTER, 2.05 GHZ	28480	0960-0085
FL4	0960-0159	1	FILTER, DC-1800 MHZ	28480	0960-0159
	9135-0048	1	FILTER, LP 4.9 GHZ	28480	9135-0048
J1	1251-2197	1	CONNECTOR 24-PIN F D SERIES (AUX A)	71468	DDM-24W78
J2	1251-1286	1	CONNECTOR 17-PIN F D SERIES (AUX B)	71468	DCM-17W58
J3	1250-0083	5	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM (INT SWEEP OUTPUT)	0331F	28JR-130-1
J4	1250-0083		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM (VERTICAL OUTPUT)	0331F	28JR-130-1
J5	1250-0083		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM (PENLIFT(BLANK) OUT)	0331F	28JR-130-1
J6	1250-0083		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM (EXT SWEEP INPUT)	0331F	28JR-130-1
J7			P/O W25 (EXT TRIGGER INPUT)		
J8	1250-0083		CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OHM (BLANKING INPUT)	0331F	28JR-130-1
J9			P/O W20 (1ST LO OUTPUT)		
J10			P/O W24 (21.4 MHZ IF OUTPUT)		
J11			P/O W1 (RF INPUT, SEE FIGURE 6-1)		
J12			P/O W11 (EXT MIXER)		
J13			P/O W23 (CAL OUTPUT)		
K1	3106-0022	2	SWITCH, COAX 22 GHZ 28V	28480	3106-0022
K2	3106-0022		SWITCH, COAX 22 GHZ 28V	28480	3106-0022
K3	3106-0021	3	SWITCH, COAX SPDT 28V	28480	3106-0021
K4	3106-0021		SWITCH, COAX SPDT 28V	28480	3106-0021
K5	3106-0021		SWITCH, COAX SPDT 28V	28480	3106-0021
L1	08565-60093	1	COIL ASSEMBLY, ALIGNMENT	28480	08565-60093
L2	08565-60094	1	COIL ASSEMBLY, ORTHOGONALITY	28480	08565-60094
R1	3100-3403	1	SWITCH-RTRY 8P7T-P8 .812-CTR-SPCG	28480	3100-3403
R2	3101-2108	1	(VIDEO FILTER) SWITCH-PB SPDT ALTNG 5A 250VAC (SIG IDENT)	28480	3101-2108
T1	08565-60086	1	ASSEMBLY, POWER TRANSFORMER (INCLUDES CONNECTORS & FUSE F2)	28480	08565-60086
U1	0960-0470	1	TRIPLER, HV 10KV	28480	0960-0470
V1	5083-4471	1	CRT	28480	5083-4471
W1	08565-20070	1	CABLE ASSEMBLY, INPUT	28480	08565-20070
W2	08565-20071	1	CABLE ASSEMBLY, RF ATTEN	28480	08565-20071
W3	08565-20072	1	CABLE ASSEMBLY, YTF INPUT	28480	08565-20072
W4	08565-20073	1	CABLE ASSEMBLY, YTF OUTPUT	28480	08565-20073
W5	08565-20074	1	CABLE ASSEMBLY, MIXER	28480	08565-20074
W6	08565-20075	1	CABLE ASSEMBLY, 1.8 LPF INPUT	28480	08565-20075
W7	08565-20076	1	CABLE ASSEMBLY, 1.8 LPF OUTPUT	28480	08565-20076
W8	08565-20077	1	CABLE ASSEMBLY, YTO	28480	08565-20077
W9	08565-20078	1	CABLE ASSEMBLY, 1ST LO OUTPUT	28480	08565-20078
W10	08565-20079	1	CABLE ASSEMBLY, TUNING STABILIZER	28480	08565-20079

Table 6-2. Replaceable Parts (Cont'd)

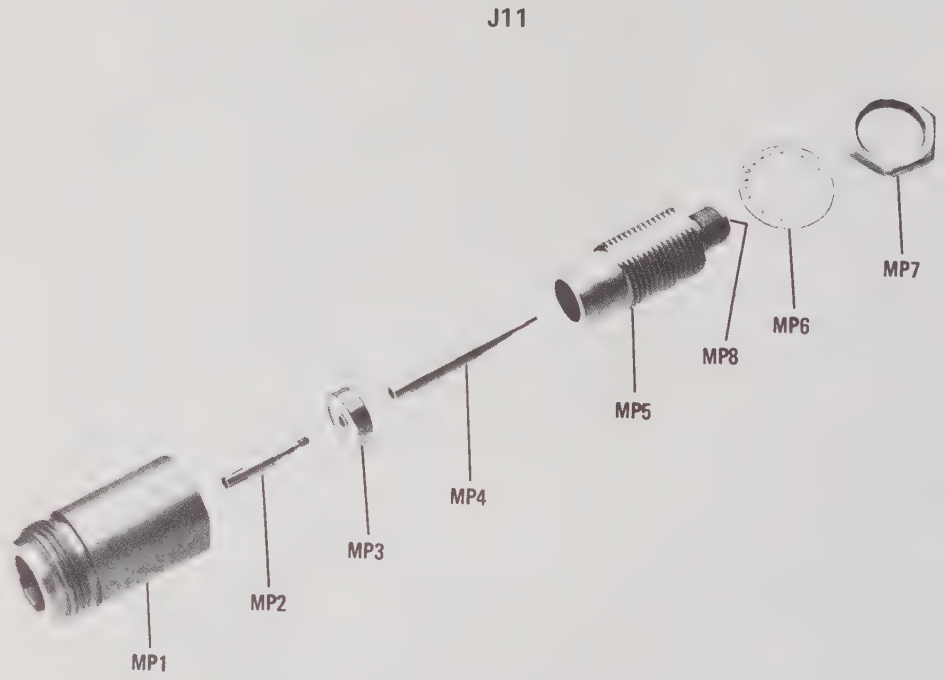
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
W11	08565-20090	1	CABLE ASSEMBLY, EXT MIXER	28480	08565-20090
W12	08565-20080	1	CABLE ASSEMBLY, EXT IF	28480	08565-20080
W13	08565-20081	1	CABLE ASSEMBLY, EXT IF IB	28480	08565-20081
W14	08565-20082	1	CABLE ASSEMBLY, 1ST IF OUTPUT	28480	08565-20082
W15	08565-20083	1	CABLE ASSEMBLY, 2.0 LPF INPUT	28480	08565-20083
W16	08565-20084	1	CABLE ASSEMBLY, 2.0 LPF OUTPUT	28480	08565-20084
W17	08565-20087	1	CABLE ASSEMBLY, 2ND CONVERTER INPUT	28480	08565-20087
W18	08565-20088	1	CABLE ASSEMBLY, 2ND CONVERTER OUTPUT	28480	08565-20088
W19	08565-20085	1	CABLE ASSEMBLY, 2ND CONVERTER BYPASS	28480	08565-20085
W20	08565-20089	1	CABLE ASSEMBLY, 1ST LO OUTPUT	28480	08565-20089
W21	08565-60059	1	CABLE ASSEMBLY, 321.4 IF(YELLOW)	28480	08565-60059
W22	08565-60060	1	CABLE ASSEMBLY, 21.4 IF (GREEN)	28480	08565-60060
W23	08565-60061	1	CABLE ASSEMBLY, 100 MHZ CAL OUTPUT(BLUE)	28480	08565-60061
W24	08565-60062	1	CABLE ASSEMBLY,21.4MHZ IF OUTPUT(VIOLET)	28480	08565-60062
W25	08565-60070	1	CABLE ASSEMBLY,EXT TRIGGER INPT(BROWN)	28480	08565-60070
W26	08565-60080	1	CABLE ASSEMBLY,YTO TO AUX B (RED)	28480	08565-60080
W27	08565-60081	1	CABLE ASSEMBLY,YTF TO AUX B (ORANGE)	28480	08565-60081
W28	08565-60058	1	CABLE ASSEMBLY, RIBBON,FREQ CONTROL	28480	08565-60058
W29	08565-60063	1	CABLE ASSEMBLY,RIBBON FRONT SWITCH BD.	28480	08565-60063
W30	08565-60064	1	CABLE ASSEMBLY,RIBBON FRONT SWITCH BD.	28480	08565-60064
W31	08565-60065	1	CABLE ASSEMBLY,RIBBON REAR SWITCH BD.	28480	08565-60065
W32	08565-60066	1	CABLE ASSEMBLY, RIBBON, FREQ DISPLAY	28480	08565-60066
W33	08565-60071	1	CABLE ASSEMBLY, RIBBON,DISPLAY SWITCH BD	28480	08565-60071
W34	08565-60092	1	CABLE ASSEMBLY, CRT	28480	08565-60092
W35	08565-60091	2	CABLE ASSEMBLY, X-DEFLECTION	28480	08565-60091
W36	08565-60091		CABLE ASSEMBLY, Y-DEFLECTION	28480	08565-60091
W37	08565-60067	1	CABLE ASSEMBLY, BEZEL DISPLAY	28480	08565-60067
W38	08565-60068	1	CABLE ASSEMBLY, BEZEL DISPLAY	28480	08565-60068
W39	08565-60069	1	CABLE ASSEMBLY, DISPLAY CONTROL	28480	08565-60069
			MISCELLANEOUS PARTS		
	5020-8863	2	RACK MOUNTING,FLNG,W/O HANDLE (OPT 908)	28480	5020-8863
	5020-8875	2	RACK MOUNTING FLNG, W/HANDLE (OPT 909)	28480	5020-8875
	5061-0090	1	KIT, FRONT HANDLE (OPT 907)	28480	5061-0090
	08565-90014	1	MANUAL, O/S (OPT 910)	28480	08565-90014
	5061-2033	1	KIT, INFO TRAY ASSEMBLY	28480	5061-2033
	9320-3714	1	8565A INSTRUMENT (PULL-OUT)CARD	28480	9320-3714

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CABINET PARTS		
	5020-8897	1	TRIM,FRONT HANDLE (OPT 909)	28480	5020-8897
	5001-0440	2	TRIM, SIDE	28480	5001-0440
	5020-8805	1	FRAME, FRONT	28480	5020-8805
	5020-8806	1	FRAME, REAR	28480	5020-8806
	5020-8837	3	STRUT, CORNER, 18"	28480	5020-8837
	5040-7201	4	FOOT, BOTTOM	28480	5040-7201
	5040-7202	1	STRIP, TRIM,TOP	28480	5040-7202
	5040-7219	2	COVER STRIP, FRONT HANDLE	28480	5040-7219
	5040-7220	2	COVER STRIP, REAR HANDLE	28480	5040-7220
	5040-7221	4	FOOT, REAR	28480	5040-7221
	5060-0428	1	FILTER, AIR	28480	5060-0428
	5060-9804	2	STRIP, HANDLE,18"	28480	5060-9804
	5060-9835	1	COVER, TOP 18"	28480	5060-9835
	5060-9847	1	COVER, BOTTOM, 18"	28480	5060-9847
	5060-9884	1	COVER, SIDE, STD.	28480	5060-9884
	5060-9942	1	COVER, SIDE, PERFORATED	28480	5060-9942
	08565-00068	1	SHIELD, TUBE, CRT	28480	08565-00068
	08558-20036	1	CCT, ENCL, TAPPED	28480	08558-20036
	08558-20037	1	END PLATE, ENCL.	28480	08558-20037
	08558-20087	2	CCT ENCL, PLAIN	28480	08558-20087
	08565-00002	1	PANEL, CONN, SUB	28480	08565-00002
	08565-00004	1	DIVIDER, CNTR, MAIN	28480	08565-00004
	08565-00007	1	BRACKET, YTF	28480	08565-00007
	08565-00008	1	BRACKET, RF BOTTOM	28480	08565-00008
	08565-00009	1	BRACKET, YTO SUPPORT	28480	08565-00009
	08565-00011	1	PLATE, SIDE	28480	08565-00011
	08565-00012	1	BRACKET, ATTENUATOR	28480	08565-00012
	08565-00013	1	BRACKET, VIDEO BD, FRONT	28480	08565-00013
	08565-00015	1	BRACKET, MIXER	28480	08565-00015
	08565-00016	1	CENTER DIVIDER	28480	08565-00016
	08565-00017	1	BRACKET, TUNE STABILIZER, FRONT	28480	08565-00017
	08565-00018	1	BRACKET, THIRD CONVERTER, REAR	28480	08565-00018
	08565-00020	1	SHIELD, IF/RF	28480	08565-00020
	08565-00023	1	BRACKET, VIDEO BD,, REAR	28480	08565-00023
	08565-00027	1	BRACKET, TRANSFORMER, MAIN	28480	08565-00027
	08565-00028	2	BRACKET, TRANSFORMER, REAR	28480	08565-00028
	08565-00029	2	BRACKET, TRANSFORMER, FRONT	28480	08565-00029
	08565-00031	1	PANEL, REAR	28480	08565-00031
	08565-00032	1	BRACKET, MOTHERBOARD	28480	08565-00032
	08565-00036	1	SHIELD, HIGH VOLTAGE	28480	08565-00036
	08565-00037	1	COVER, HIGH VOLTAGE	28480	08565-00037
	08565-00041	2	PANEL, FRONT LOWER LEFT	28480	08565-00041
	08565-00067	2	PANEL, FRONT LOWER LEFT(OPT 200)	28480	08565-00067
	08565-00042	2	BRACKET, FAN	28480	08565-00042
	08565-00044	1	COVER, LOG AMPLIFIER	28480	08565-00044
	08565-00045	1	COVER, BANDWIDTH FILTER #2	28480	08565-00045
	08565-00046	1	COVER, STEP GAIN	28480	08565-00046
	08565-00066	1	COVER, STEP GAIN/OSCILLATOR (OPTION 100)	28480	08565-00066
	08565-00049	1	COVER, BANDWIDTH FILTER #1	28480	08565-00049
	08565-00050	1	COVER, VARIABLE GAIN	28480	08565-00050
	08565-00056	1	COVER, FAN	28480	08565-00056
	08565-00059	2	SHIELD	28480	08565-00059
	08565-00061	1	SHIELD, X-Y-Z ASSEMBLY	28480	08565-00061
	08565-00064	1	RESISTOR, BANDWIDTH KNOB 5K OP	28480	08565-00064
	08565-00065	2	IF COVER, BLANK	28480	08565-00065
	08565-20006	1	SHIELD, CRT SUPPORT	28480	08565-20006
	08565-20051	2	CIRCUIT ENCLOSURE	28480	08565-20051
	08565-20060	4	STUD, SHOCK MOUNT	28480	08565-20060
	08565-20064	4	DISPLAY SHAFT	28480	08565-20064
	08565-20065	1	DIVIDER, FRONT FRAME	28480	08565-20065
	08565-20093	1	CRT ANCLOSURE, 4-TAP	28480	08565-20093
	08565-20096	1	CRT ANCLOSURE, 8-TAP	28480	08565-20096
	08565-20100	1	STRUT, MODIFIED	28480	08565-20100
	08565-40002	1	BEZEL, CRT	28480	08565-40002
	08565-40003	1	WINDOW, LOWER CRT	28480	08565-40003
	08565-40004	1	WINDOW, UPPER CRT	28480	08565-40004
	86701-00017	1	DISK, FAN SHIELD (OPT 400)	28480	86701-00017
	1490-0841	4	COUPLER, SHAFT	28480	1490-0841
	1520-0094	4	ISOLATOR MOUNT	76005	J-2924-2-1
	6960-0006	1	HOLE PLUG	0421C	D-2587-LC8
	8160-0270	1	SAFETY PLATE, RFI	28480	8160-0270
	08565-00047	1	COVER, UP-DOWN CONVERTER (OPTION 100)	28480	08565-00047
	08565-00048	1	COVER, 3MHZ FILTER (OPTION 100)	28480	08565-00048

Table 6-3. Code List of Manufacturers

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
0000J	U.S.A. COMMON	ANY SUPPLIER OF THE U.S.		
01070	HOLSWORTHY ELECTRONICS LTD	HOLSWORTHY ENGL	ND	
0146H	STETTNER-TRUSH INC	CAZENOVIA	NY	
0160G	ALLEN-BRADLEY CO	MILWAUKEE	WI	
0169H	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	
0185D	RCL ELECTRONICS INC	MANCHESTER	NH	
01AA4	SPRAGUE ELECTRIC DEARBORN ELEK DIV	LONGWOOD FL		32750
01AAE	SPECTROL ELECTRONICS CORP	CITY OF IND	CA	
01AAG	FERROXCUBE CORP	SAUGERTIES	NY	
0192A	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
0276A	ILLINOIS TOOL WORKS INC FASTEX DIV	DES PLAINES IL		60016
0350A	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE NY		13201
0199A	TRANSITRON ELECTRONIC CORP	WAKEFIELD	MA	
03A8A	KDI PYROFILM CORP	WHIPPANY NJ		07981
0203G	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	
0013F	NIMET INDUSTRIES INC	SOUTH BEND	IN	46621
0214E	RAYCHEM CORP	MENLO PARK	CA	
0217J	AMATOM ELEK HARDWARE DIV OF MITE	NEW ROCHELLE	NY	
0217R	AIRCO SPEER ELEK DIV AIR RDCN CO	NOGALES	AZ	
06776	ROBINSON NUGENT INC	NEW ALBANY IN		47150
0223G	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	
0227C	TRW INC BURLINGTON DIV	BURLINGTON	IA	
09705	PENNTUBE PLASTICS CO DIV DIXON IND	CLIFTON HEIGHTS	PA	19018
0G791	THOMPSON BREMER DIV VARE	CHICAGO IL		60622
103A9	CHICAGO SWITCH INC	CHICAGO	IL	60647
0248C	CTS OF BERNE INC	BERNE	IN	
025AA	CLAROSTAT MFG CO INC	DOVER	NH	
0260H	THERMALLOY CO	DALLAS	TX	
0271C	GENERAL INSTR CORP SEMIDON PROD GP	WICKSVILLE	NY	
15454	RODAN INDUSTRIES INC	ANAHEIM CA		92806
0274D	ELEC-TROL INC	SAUGUS	CA	
027AH	OMNI SPECTRA INC	FARMINGTON	MI	
0288C	SILICONIX INC	SANTA CLARA	CA	
0291J	SIGNETICS CORP	SUNNYVALE	CA	
0299E	MEPCO/ELECTRA CORP	MINERAL WELLS	TX	
0327C	GOWANDA ELECTRONICS CORP	GOWANDA	NY	
0329R	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	
0331F	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS	IN	
0340F	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	
0341B	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON	NC	
27264	MOLEX PRODUCTS CO	DOWNERS GROVE I		60515
284A0	HP DIV 00 CORPORATE	PALO ALTO	CA	
0374D	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE	CA	
0379D	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	
0420J	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	
0421C	STIMPSON EDWIN B CO INC	BROOKLYN	NY	
59730	THOMAS & BETTS CO THE	ELIZABETH NJ		07207
0439C	CENTRE ENGINEERING INC	STATE COLLEGE	PA	
0442F	ASSOCIATED SPRING CORP	BRISTOL	CT	
0447E	CAMBRIDGE THERMIONIC CORP	CAMBRIDGE	MA	
7146A	ITT CANNON ELECTRIC CO	SANTA ANA CA		92702
0450G	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VLGE	IL	
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC CT		06226
0456C	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE	PA	
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON	CA	92634
0460D	FEDERAL SCREW PRODUCTS CO	CHICAGO	IL	
73899	J F D ELECTRONICS CORP	BROOKLYN NY		11219
74276	SIGNALITE DIV GENERAL INST CORP	NEPTUNE NJ		07753
74970	JOHNSON E F CO	WABECA MN		56093
0467B	TRW INC PHILADELPHIA DIV	PHILADELPHIA	PA	
0470C	LITTELFUSE INC	DES PLAINES	IL	
76005	LORD MFG CO DIV OF LORD CORP	ERIE PA		16512
763A1	3M COMPANY	ST PAUL	MN	55101
0473G	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF IND	CA	
76854	OAK IND INC SW DIV	CRYSTAL LAKE IL		60014
77147	PATTON-MACGUYER CO DIV OF AVID CORP	PROVIDENCE RI		02905
781A9	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL		60126
0487F	C-W INDUSTRIES	WARMINSTER	PA	
79963	ZIERICK MFG CO	MT KISCO NY		10549
0552D	DALE ELECTRONICS INC	COLUMBUS	NE	
0573B	INDUSTRIAL RETAINING RING CO	IRVINGTON	NJ	
0576I	SEALECTRO CORP	MAMARONECK	NY	
99700	GRAPHIC CALCULATOR CO INC	BARRINGTON IL		60010
9A469	DURANT MFG CO	NEW ROCHELLE NY		10801
K3105	CAMBION ELECTRONIC PRODUCTS LTD	CASTLETON	EG	
0365A	MEPCO/ELECTRA CORP	SAN DIEGO	CA	



Reference Designation	HP Part Number	Qty	Description	Mfr. Code	Mfr. Part Number
J11	86290-60005	1	Connector Assy (Type N)	28480	86290-60005
J11MP1	1250-0914	1	Body: RF Connector (Type N)	02660	131-150
J11MP2	1250-0915	1	Contact: RF Connector (Type N)	02660	131-149
J11MP3	5040-0306	1	Insulator	28480	5040-0306
J11MP4	08555-20093	1	Center Conductor	28480	08555-20093
J11MP5	08555-20094	1	Body: Bulkhead	28480	08555-20094
J11MP6	2190-0104	1	Washer: Lock 0.439" ID	0000J	OBD
J11MP7	2950-0132	1	Nut: Hex 7/16 – 28	0000J	OBD
J11MP8	08761-2027	1	Insulator	28480	08761-2027

Figure 6-1. INPUT 50Ω Connector J11, Exploded View

SECTION VII
MANUAL BACKDATING CHANGES

7-1. INTRODUCTION

7-2. This section normally contains information for adapting this manual to instruments for which the content does not apply directly. Since this manual does apply directly to instruments having serial numbers listed on the title page, no backdating information is given here. Refer to INSTRUMENTS COVERED BY MANUAL in Section I for additional important information about serial number coverage.

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repairing the Model 8565A Spectrum Analyzer. Circuit descriptions and simplified block diagrams are included with the schematic diagrams of the assemblies. Component location illustrations are also contained in this section. Schematic presentations in this manual show electrical circuit operation and are not intended to serve as wiring diagrams.

8-3. ASSEMBLY SERVICE SHEETS

8-4. The schematics are arranged by service sheets. The service sheet numbers appear in the lower right-hand corner of the schematics (large number above assembly number). Included in the service sheet is the schematic as well as the accompanying circuit theory, component-parts location diagram, simplified block diagrams, and schematic-level troubleshooting.

8-5. CIRCUIT DESCRIPTIONS

8-6. A detailed circuit description for each individual schematic diagram is placed on the facing left-hand foldout page. This places material needed for component-level diagnosis in one location and allows easy correlation between function and specific circuitry.

8-7. TROUBLESHOOTING

WARNING

With the ac power cable connected, the ac line voltage is present at the terminals of power line assembly A41FL1 (mounted on rear panel) and at the LINE switch, whether the LINE switch is on or off. With the covers removed, these terminals are exposed. Care must be taken to avoid contact with these terminals.

With the covers removed, terminals are exposed that have voltages capable of causing death. Any maintenance or repair of the opened instrument under voltage should be carried out only by a skilled person who is aware of the hazard involved.

After disconnecting ac line power cord, allow a minimum of 30 seconds for High Voltage Power Supply to discharge before removing High Voltage Power Supply protective cover.

8-8. Troubleshooting is generally divided into two maintenance levels in this manual. The first level isolates a trouble to a circuit or assembly. This is done by using troubleshooting block diagrams that provide signal levels and techniques to isolate the cause of a malfunction and identify the defective assembly.

8-9. The second maintenance level isolates the trouble to the component. Schematic diagrams and circuit descriptions for each assembly aid in troubleshooting to the component level.

8-10. When troubleshooting a transistor stage, check for a forward bias condition of the base-emitter junction. If this condition exists, the next step is to remove this forward bias by shorting the base to the emitter and checking to see if the collector voltage rises to the approximate level of the supply. The next check that can be made, if it is known that the transistor is not operating in a saturated condition, is to check for a voltage drop between emitter and collector. These serve only as quick checks and will help in getting started with the problem.

8-11. RECOMMENDED TEST EQUIPMENT

8-12. Test equipment required to maintain the Model 8565A is listed in Table 1-3. If the equipment listed is not available, equipment that meets the minimum specifications shown may be substituted.

8-13. REPAIR

8-14. After-Service Product Safety Checks. Visually inspect interior of instrument for any signs of abnormal internally generated heat, such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. Determine and remedy cause of any such condition.

8-15. Using a suitable ohmmeter, check resistance from instrument enclosure to ground pin on power cord plug. The reading must be less than one ohm. Flex the power cord while making this measurement to determine whether intermittent discontinuities exist.

8-16. Check resistance from instrument enclosure to line and neutral (tied together) with the line switch ON and the power source disconnected. The minimum acceptable resistance is two megohms. Replace any component which results in failure to meet this minimum.

8-17. Check line fuse to verify that a correctly rated fuse is installed.

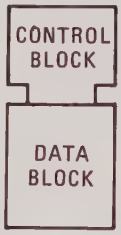
Table 8-1. Schematic Diagram Notes (1 of 3)

SCHEMATIC DIAGRAM NOTES

R, L, C	Resistance is in ohms, inductance is in microhenries, capacitance is in microfarads, unless otherwise noted.
P/O	Part of.
*	Asterisk denotes a factory-selected value. Value shown is typical.
○	Panel control.
⊘	Screwdriver adjustment.
▭	Encloses front panel designation.
▭	Encloses rear panel designation.
—— - - ——	Circuit assembly borderline.
- — — — — -	Other assembly borderline.
——► ——	Heavy line with arrows indicates path and direction of main signal.
——► — —	Heavy dashed line with arrows indicates path and direction of main feedback.
CW	Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.
⬭	Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe; e.g. (947) denotes white base, yellow wide stripe, violet narrow stripe.

Table 8-1. Schematic Diagram Notes (2 of 3)

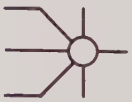
SCHEMATIC DIAGRAM NOTES



Logic device symbol.

Wired OR.

Wired AND.



Isolated common connection.

Ferrite bead (prevents high frequency parasitic oscillations).

Tuned cavity.

Three-pole YIG-tuned filter.

Isolator (circulator type).

Table 8-1. Schematic Diagram Notes (3 of 3)

SCHEMATIC DIAGRAM NOTES

Test point location. Number denotes test point number.

Assembly ground.

Chassis ground.

Earth ground.

Indicates "WARNING: HAZARDOUS VOLTAGE ."

Schottky diode.

Light-emitting diode (LED).

Breakdown diode.

PIN diode.

Varactor.

Table 8-2. Assemblies Crossreferenced to Service Sheets (1 of 2)

Assembly Number	Assembly Name	Service Sheet Number
A1	Front Panel Display Assembly	27
A2	Front Panel Control Assembly	5
A3	Display Adjust Assembly	27
A4	Z Axis Amplifier Assembly	30
A5	Y Deflection Amplifier Assembly	29
A6	X Deflection Amplifier Assembly	28
A7	Storage Assembly	31
A8	High Voltage Power Supply Assembly	32
A9	High Voltage Oscillator Assembly	32
A10	Display Motherboard Assembly	33
A11	DVM Digital Assembly	18
A12	DVM Analog Assembly	17
A13	Relay Driver Assembly	9
A14	Tuning Stabilizer Control Assembly	15
A15	Sweep Attenuator Assembly	11
A16	Sweep Generator Assembly	10
A17	Frequency Control Assembly	12
A18	Full Multiband Assembly	13
A19	YIG Driver Assembly	14
A20	Bias Assembly	19
A21	Video Assembly	25
Opt. 100 A21	Video-100 Hz Assembly	40
A22	Log Amplifier	24
A23	Bandwidth Filter No. 2 Assembly	23

Table 8-2. Assemblies Crossreferenced to Service Sheets (2 of 2)

Assembly Number	Assembly Name	Service Sheet Number
A24	Step Gain Amplifier Assembly	22
Opt. 100 A24	Step Gain Amplifier/Oscillator Assembly	39
Opt. 100 A25	Up-Down Converter Assembly	37
Opt. 100 A26	3 MHz Filter Assembly	38
A27	Bandwidth Filter No. 1 Assembly	21
A28	Variable Gain Assembly	20
A29	RF-IF Motherboard Assembly	26
A30	First Mixer Assembly	6
A31	YIG-Tuned Oscillator Assembly	6
A32	YIG-Tuned Filter Assembly	6
A33	Limiter	6
A34	RF Attenuator Assembly	6
A35	Second Converter Assembly	7
A36	Tuning Stabilizer Assembly	16
A37	Third Converter Assembly	8
A38	Readout Input Assembly	34
A39	Readout Driver Assembly	35
A40	Power Supply Assembly	36
A41	Line Module and Cable Assembly	36

8-18. A1 Front Panel Display Assembly Removal

a. Remove top trim strip from front frame (use small, common screwdriver).

b. Remove trim strip from left side of front frame (standard) or from left handle (Option 907).

c. If 8565A is an Option 907, remove left handle.

d. Remove two screws from left side of front frame.

NOTE

In the following step, do not remove two small screws in top of front panel frame.

e. Remove one screw (close to center on Front Panel Display Assembly side) from top and one screw (close to center on Front Panel Display Assembly side) from bottom of front frame.

f. Carefully remove Front Panel Display Assembly and disconnect the three ribbon cables (a special tool, HP Part Number 8710-0580, for ease of disconnecting ribbon cable connectors is contained in the 8565A Service Package, HP Part Number 08565-60100).

8-19. A2 Front Panel Control Assembly Removal

a. Remove top trim strip from front frame (use small, common screwdriver).

b. Remove two screws from top of front frame (Front Panel Control Assembly side).

NOTE

In the following step, do not remove the two screws nearest the right-hand side of the 8565A in the bottom of the front frame.

c. Remove two screws closest to center screw on bottom of front frame (control assembly side).

d. Carefully remove A2 Front Panel Control Assembly and disconnect the three ribbon cables (a special tool, HP Part Number 8710-0580, for ease of disconnecting ribbon cable connectors is contained in the 8565A Service Package, HP Part Number 08565-60100). Cable from A2A3 Tuning Assembly to A29 RF-IF Motherboard must also be disconnected.

8-20. Disassembling A2 Front Panel Control Assembly Rotary Switches

8-21. Removal of Front Dress Panel and Sub-front Panel

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19.

b. Remove the following front-panel knobs: TUNING (FINE and coarse) RESOLUTION BW, FREQUENCY SPAN/DIV, MANUAL SWEEP, TRIGGER LEVEL, SWEEP TIME/DIV, PRESELECTOR PEAK, and REF LEVEL FINE.

c. Remove REFERENCE LEVEL knob by first removing retaining ring from shaft, then black index disc, then REFERENCE LEVEL knob.

d. Remove 3/8 inch nut and lockwasher from SWEEP TIME/DIV control.

e. Remove two 1/2 inch nuts (FREQUENCY SPAN/DIV and REFERENCE LEVEL controls) and remove INPUT ATTEN pointer. Remove front dress panel.

f. Remove ten 4-40 screws (A2MP143 through 152) from rear side of A2A1 Front Switch Assembly and one long 4-40 screw (A2MP92) and spacer (A2MP105) from A2A4 Rear Switch Assembly (See Figure 8-1).

g. Remove switch assemblies from sub-front panel, carefully manuvering PC boards to clear A2A3 Tuning Assembly. (Remove Tuning Assembly, if necessary, by removing four 4-40 screws from bottom plate of Tuning Assembly.)

h. Unsolder the five wires from A2A5 Reference Level Encoder Assembly.

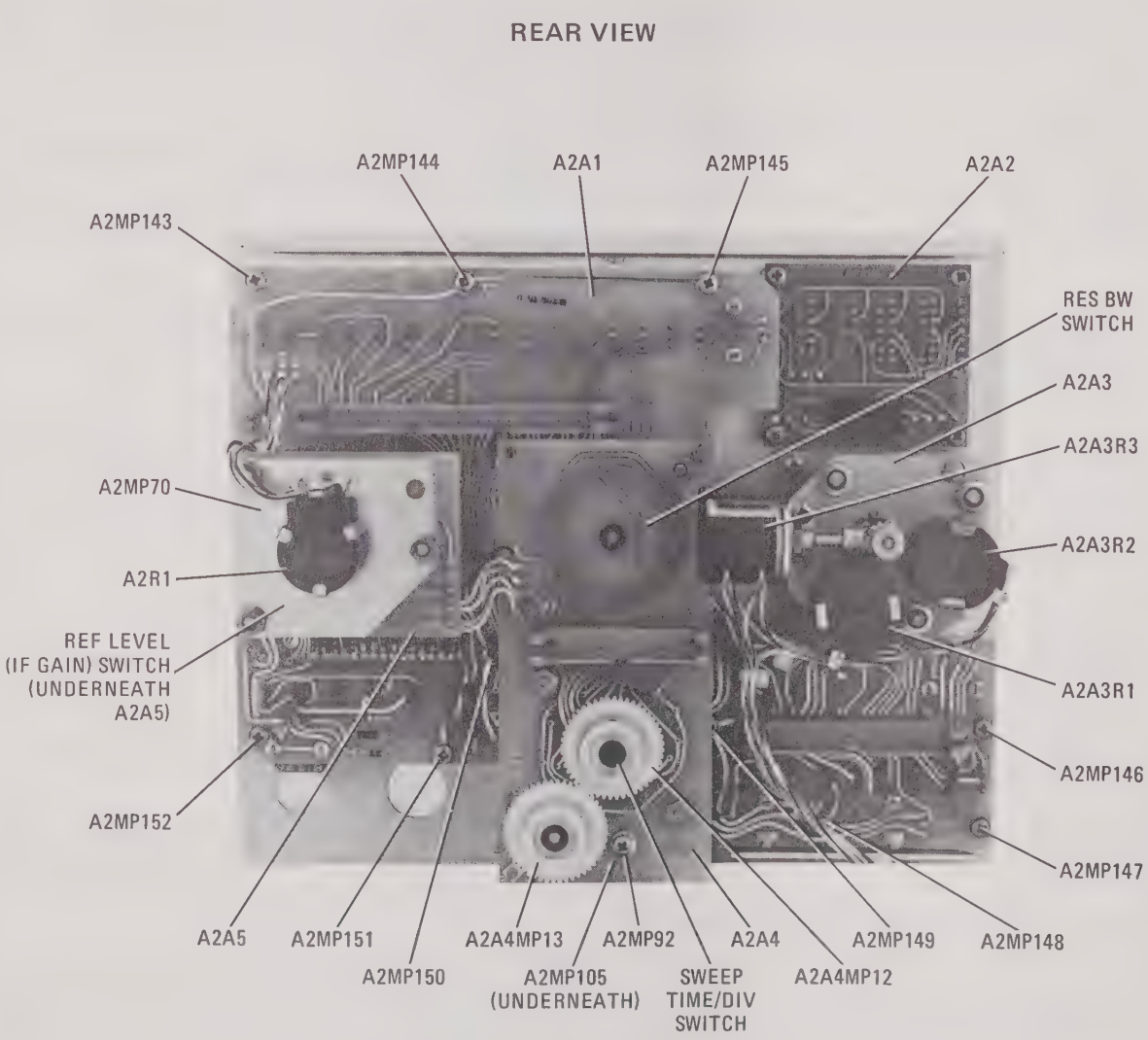


Figure 8-1. A2 Front Panel Control Assembly, Rear View

8-22. Disassembling RESOLUTION BW Switch (See figure 8-1).

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19; Removal of Front Panel and Subpanel procedure, Paragraph 8-21; and Disassembling RESOLUTION BW Switch procedure, Paragraph 8-22.

b. Remove two 4-40 nuts and lock washers from top portion of A2A4 Rear Switch Assembly.

c. Remove Rear Switch Assembly and remove two spacers from screws.

d. Remove bandwidth rotor (A2MP91).

e. Remove res BW shaft (A2MP85) by removing retaining ring and spacer washers, if any, at front of res BW shaft. Slide shaft, with brass drive hub attached, toward rear of switch assembly.

NOTE

Brass drive hub (A2MP75) on res BW shaft (A2MP85) is preset against collar on shaft (see Figure 8-3b). Do not remove drive hub unless drive hub or res BW shaft has been damaged.

8-23. Disassembling FREQUENCY SPAN/DIV Switch (see Figure 8-2).

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19; Removal of Front Panel and Subpanel procedure, Paragraph 8-21; and Disassembling RESOLUTION BW Switch procedure, Paragraph 8-22.

b. Remove bandwidth detent (A2MP82).

c. Remove four 4-40 nuts from rear of A2A1 Front Switch Assembly, holding FREQUENCY SPAN/DIV switch against front of Front Switch Assembly.

d. Remove two long 4-40 screws, spacers, and frequency span detent (A2MP83) with brass bushing (A2MP88) attached.

e. Loosen set screws in brass coupling hub (A2MP72) on rear side of Front Switch Assembly and remove coupling hub from frequency span shaft (A2MP210).

f. Remove frequency span shaft (A2MP210) with frequency span rotor (A2MP84), slotted bushing (A2MP79), brass drive hub (A2MP73), and torsion spring (A2MP118) attached.

g. Remove torsion spring (A2MP118) from contact side of frequency span rotor (A2MP84) and slide frequency span rotor with slotted bushing (A2MP79) off end of frequency span shaft (A2MP210).

NOTE

Brass drive hub (A2MP73) on frequency span shaft (A2MP210) is preset at 15.200 mm (0.600 inch) from end of shaft (see Figure 8-3e). Do not remove brass drive hub (A2MP73) unless drive hub or frequency span shaft has been damaged.

8-24. Disassembling REF LEVEL (IF Gain) Switch (see Figure 8-1).

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19, and Removal of Front Panel and Subpanel procedure, Paragraph 8-21.

b. Remove three 4-40 nuts and lock washers from level pot plate (A2MP70). There are four set screws in the Reference Level Encoder Assembly rotary switch hub (A2A5MP2). Loosen the two set screws closest to Front Switch Assembly PC board. Slide ref level fine shaft (A2MP67) out toward front of Front Switch Assembly.

c. Remove level pot plate (A2MP70), REF LEVEL FINE pot (A2R1), and Reference Level Encoder Assembly (A2A5) together. Remove three short spacers (A2MP92 through MP94) from between level pot plate and Reference Level Encoder Assembly.

d. Unsolder three REF LEVEL FINE pot leads from Front Switch Assembly PC board.

e. Remove three long spacers (A2MP106) from long screws. Remove fixed shaft (A2MP87) with slotted crank (A2MP71) attached.

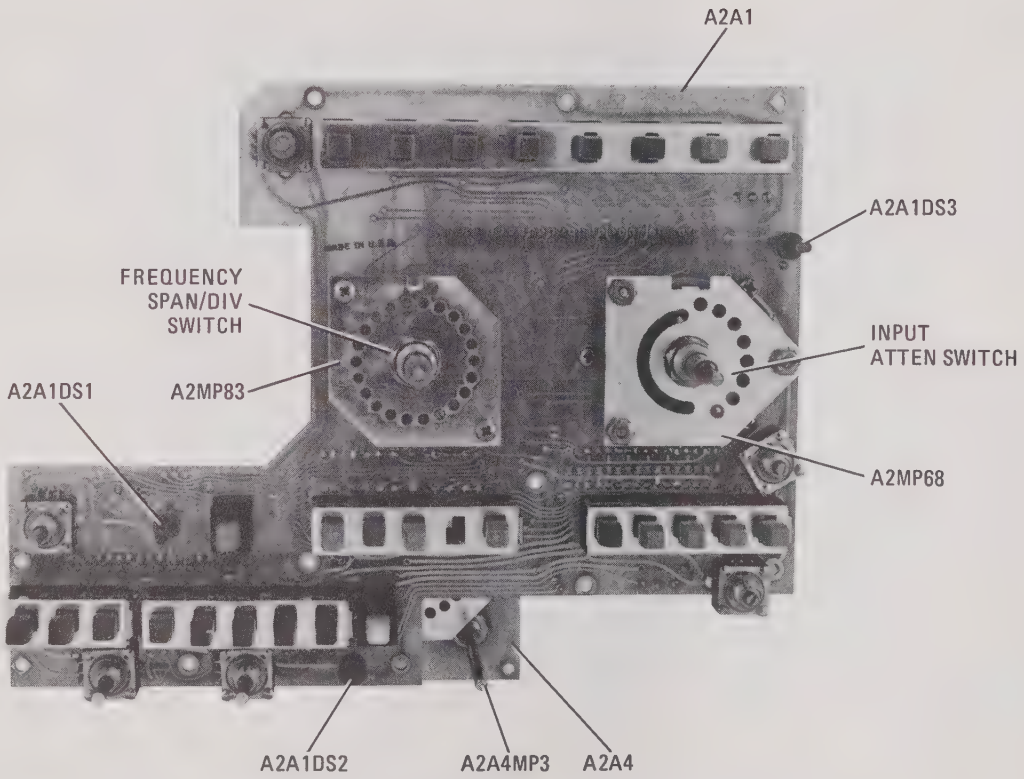


Figure 8-2. Switch Assemblies, Front View

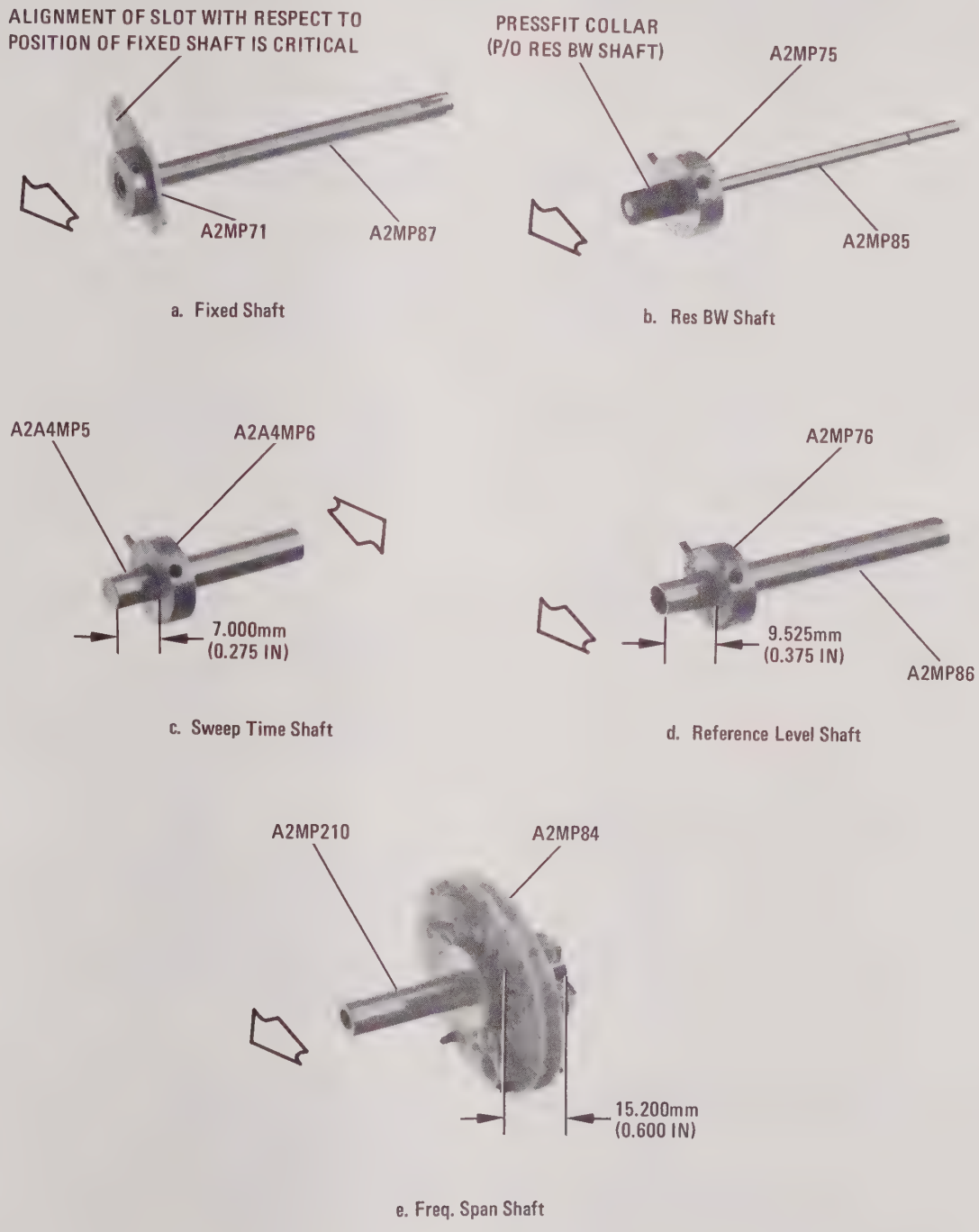


Figure 8-3. Factory Preset Shaft Assemblies

NOTE

Slotted crank (A2MP71) on fixed shaft (A2MP87) is preset for proper alignment (see Figure 8-3a). Do not remove slotted crank (A2MP71) unless slotted crank or fixed shaft has been damaged.

f. Loosen set screws in rotating lockout (A2MP77) and remove rotating lockout.

g. Remove three 4-40 nuts and lock washers holding IF gain detent (A2MP69). Remove three long screws (A2MP97 through MP99) and spacers. Remove conical compression spring (A2MP113).

h. Remove ball bearing and small spring from double-contact (ref level) rotor (A2MP81).

NOTE

Rear brass drive hub (A2MP76) on reference level shaft (A2MP86) is preset at 9.525 mm (0.375 inch) from end of shaft (see Figure 8-3d). Do not remove rear brass drive hub (A2MP76) unless drive hub or reference level shaft has been damaged.

i. Press reference level shaft (A2MP86) from rear side of switch assembly and loosen set screws in front brass drive hub (A2MP74) on front side of Front Switch Assembly.

j. Remove reference level shaft (A2MP86) with rear brass drive hub (A2MP76) attached and remove double-contact (ref level) rotor (A2MP81).

8-25. Disassembling INPUT ATTEN Switch (see Figure 8-2).

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19, and Removal of Front Panel and Subpanel procedure, Paragraph 8-21.

b. Remove three 4-40 nuts, lock washers, spacers, and screws holding attenuator detent (A2MP68). Remove attenuator detent.

c. If REF LEVEL (IF gain) switch has not been disassembled, loosen set screws in front brass drive hub (A2MP74).

d. Remove double-contact (attenuator) rotor (A2MP80). Remove ball bearing and small spring from double-contact (attenuator) rotor.

8-26. Disassembling SWEEP TIME/DIV Switch (see Figure 8-1).

a. Perform A2 Front Panel Control Assembly Removal procedure, Paragraph 8-19, and Removal of Front Panel and Subpanel procedure, Paragraph 8-21.

b. Loosen set screws in 48 tooth spur gear (A2A4MP12) closest to center on rear side of A2A4 Rear Switch Assembly. Remove 48 tooth spur gear and flat washer.

c. Remove two 4-40 nuts and lock washers from rear side of A2A4 Rear Switch Assembly.

d. Remove two 4-40 screws, spacers, and sweep time detent (A2A4MP1). Remove ball bearing and small spring from sweep time rotor (A2A4MP4).

e. Remove sweep time rotor (A2A4MP4) and sweep time shaft (A2A4MP5) with brass drive hub (A2A4MP6) attached.

NOTE

Brass drive hub (A2A4MP6) on sweep time shaft (A2A4MP5) is preset at 7.000mm (0.275 inch) from end of shaft (see Figure 8-3C). Do not remove brass drive hub (A2A4MP6) unless drive hub or sweep time shaft has been damaged.

8-27. Assembling SWEEP TIME/DIV Switch.

a. Place sweep time rotor (A2A4MP4) with contact fingers down on front side of A2A4 Rear Switch Assembly. The sweep time rotor is a double-contact rotor with no stop pins.

b. Place black sweep time shaft (A2A4MP5) with preset brass drive hub (A2A4MP6) in sweep time rotor (A2A4MP4) with pin (on brass drive hub) in one of 22 slots in rotor and with long end of sweep time shaft

(A2A4MP5) through sweep time rotor (A2A4MP4).

c. Place flat washer (A2A4MP27) over long end of sweep time shaft (rear side of A2A4 Rear Switch Assembly).

d. Place 48 tooth spur gear (A2A4MP12) on sweep time shaft (rear side of A2A4 Rear Switch Assembly). Be sure 48 tooth spur gear (A2A4MP12) is as far down on sweep time shaft (A2A4MP5) as it will go. Tighten set screw in 48 tooth spur gear.

e. Place small spring in hole in sweep time rotor (A2A4MP4) and apply small amount of lubricant grease to small spring and rubbing part of sweep time rotor.

CAUTION

Do not apply lubricant to metal contact fingers on rotor or contacts on PC board.

f. Place ball bearing on small spring in sweep time rotor (A2A4MP4).

g. Hold sweep time detent (A2A4MP1) with stop tab pointing downward. Sweep time detent has 22 detent holes and has short brass bushing (no threads showing) fastened to it. Place two 3/4 inch long 4-40 screws through top side of sweep time detent (A2A4MP1).

h. Place one 1/2 inch long spacer on each 3/4 inch long screw and place sweep time detent (A2A4MP1) over sweep time rotor (A2A4MP4).

i. Hold in place and fasten on rear side of A2A4 Rear Switch Assembly with small lock washers and 4-40 nuts.

j. Check switch for mechanical ease of movement by rotating 48 tooth spur gear (A2A4MP12). This switch has no stop pins so it should rotate freely through 360 degrees. Position sweep time rotor (A2A4MP4) so contacts are with 10 ms arrow on front side of A2A4 Rear Switch Essembly PC board.

8-28. Assembling FREQUENCY SPAN/DIV and RESOLUTION BW Switches.

a. Insert slotted bushing (A2MP79) into frequency span rotor (A2MP84) from contact finger side of rotor. Insert frequency span shaft (A2MP210), with brass drive hub (A2MP73) attached, short end through opposite side of frequency span rotor (side without contact fingers). Rotate frequency span shaft (A2 MP210) so pin (on brass drive hub) falls into one of 22 slots in frequency span rotor (A2MP84).

b. Align slotted bushing (A2MP79) and slip hairpin-like torsion spring (A2MP118) through slots of slotted bushing from side of frequency span rotor (A2MP84) with single raised pin. Place bent ends of torsion spring (A2MP118) between two raised pins on opposite side of frequency span rotor (A2MP84) to secure torsion spring.

c. Place small spring in hole in frequency span rotor (A2MP84) and apply small amount of lubricant grease to small spring and rubbing part of frequency span rotor.

CAUTION

Do not apply lubricant to metal contact fingers on rotor or contacts on PC board.

d. Place ball bearing on small spring. Place frequency span detent (A2MP83) over frequency span shaft (A2MP210) with stop tab pointing downward. The frequency span detent (A2MP83) has 22 detent holes and has long brass bushing secured with two nuts. Position frequency span rotor (A2MP84) so stop tab of frequency span detent (A2MP83) does not fall within the small span between stop pins on the frequency span rotor.

e. Place 41 mm (1 5/8 inch) long screws in holes of frequency span detent (A2MP83) with screw heads on same side of frequency span detent as threaded part of brass bushing. Place 13 mm (1/2 inch) spacer on each screw.

f. Carefully place partially assembled FREQUENCY SPAN/DIV switch on A2A1 Front Switch Assembly PC board with frequency span detent (A2MP83) positioned so stop tab is toward top of A2A1 PC board (see Figure 8-2). Fasten FREQUENCY SPAN/DIV switch with two 4-40 nuts on each long screw (rear side of A2A1 Front Switch Assembly PC board). Do not use lock washers.

g. Rotate FREQUENCY SPAN/DIV switch to check for proper alignment. If switch is binding, loosen four 4-40 nuts on rear side of A2A1 Front Switch Assembly and realign as necessary.

h. Place bandwidth detent (A2MP82) over long screws with stop tab pointed outward and toward top of A2A1 Front Switch Assembly. The bandwidth detent (A2MP82) has 22 detent holes and has large center hole (22 mm).

i. Place ball bearing in detent hole near bottom of bandwidth detent (A2MP82).

j. Place brass coupling hub (A2MP72) over frequency span shaft (A2MP210) with pin pointing outward. Place black end of res BW shaft (A2MP85), with preset brass drive hub (A2MP75) attached (see Figure 8-3b), through single-contact bandwidth rotor (A2MP91). Insert res BW shaft (A2MP85) from side opposite finger contact of bandwidth rotor (A2MP91) allowing pin in brass drive hub (A2MP75) to fall into one of 22 slots in bandwidth rotor.

k. Place small spring in hole in bandwidth rotor (A2MP91) and apply small amount of lubricant grease to small spring and rubbing part of bandwidth rotor.

CAUTION

Do not apply lubricant to metal contact fingers on rotor or contacts on PC board.

l. Place long part of res BW shaft (A2MP85) into frequency span shaft (A2MP210) on A2A1 Front Switch Assembly making sure that small spring in bandwidth rotor (A2MP91) is directly over ball bearing on bandwidth detent (A2MP82).

m. Place 13 mm (1/2 inch) spacer on each long screw and place A2A4 Rear Switch Assembly over screws. Fasten with lockwashers and 4-40 nuts. End of res BW shaft (A2MP85) must not bind on edges of hole in A2A4 Rear Switch Assembly PC board.

n. Place small flat washer over front end of res BW shaft (A2MP85) and secure with small retaining ring.

o. Push-pull action of switch should be pushed in. Adjust brass coupling hub (A2MP72) by holding switch assemblies front side up. Be sure brass coupling hub (A2MP72) has dropped down as far as possible with pin (on brass coupling hub) in one of 22 slots in bandwidth rotor (A2MP91).

p. Tighten two set screws in brass coupling hub (A2MP72). Switch should rotate freely and push-pull freely in any position of switch.

8-29. Assembling REF LEVEL (IF Gain) and INPUT ATTEN Switches.

a. Place small spring in hole in double-contact (attenuator) rotor (A2MP80) and apply small amount of lubricant grease to small spring and rubbing part of double-contact (attenuator) rotor. Double-contact (attenuator) rotor (A2MP80) has a long pin protruding from side opposite contact fingers.

CAUTION

Do not apply lubricant to metal contact fingers on rotor or contacts on PC board.

b. Place three 19 mm (3/4 inch) long 4-40 screws through attenuator detent (A2MP68) with heads on same side of attenuator detent as threaded part of brass bushing. Attenuator detent has only eight detent holes and has long brass bushing secured with two nuts.

c. Hold attenuator detent (A2MP68) with threaded portion of brass bushing facing downward and hold the three screws in place. Place one 13 mm (1/2 inch) spacer on each of the three screws.

d. Place brass drive hub (A2MP74) on attenuator detent (A2MP68) making sure the pin (set off-center on side of brass drive hub) is toward bottom side, closest to attenuator detent. Place ball bearing on second or third hole from stop tab on attenuator detent (A2MP68).

e. Place double-contact (attenuator) rotor (A2MP80) on top of brass drive hub (A2MP74) with long pin pointed downward and small spring over ball bearing.

f. Place A2A1 Front Switch Assembly, front side down, over three screws with stop tab of attenuator detent (A2MP68) toward top edge of A2A1 Front Switch Assembly PC board. Secure switch with three lock washers and 4-40 nuts on rear side of A2A1 Front Switch Assembly.

g. Insert large hollow reference level shaft (A2MP86), with preset brass drive hub (A2MP76) attached, through double-contact (ref level) rotor (A2MP81), long end first through slotted side of rotor. Pin in brass drive hub (A2MP76) should fall into one of 22 slots in double-contact (ref level) rotor.

h. Align brass drive hub (A2MP74) and double-contact (attenuator) rotor (A2MP80) using shaft of small pozi-drive screwdriver. Insert long part of reference level shaft (A2MP86) through rear side of A2A1 Front Switch Assembly PC board, double-contact (attenuator) rotor (A2MP80), and brass drive hub (A2MP74) so reference level shaft protrudes through front of switch assembly.

i. Place three 57 mm (2 1/4 inch) long screws through front side of A2A1 Front Switch Assembly PC board. Place one 13 mm (1/2 inch) spacer on each of the three screws protruding through rear side of A2A1 Front Switch Assembly.

j. Place small spring in hole in double-contact (ref level) rotor (A2MP81) and apply small amount of lubricant grease to small spring and rubbing part of double-contact (ref level) rotor.

CAUTION

Do not apply lubricant to metal contact fingers on rotor or contacts on PC board.

k. Place conical compression spring (A2MP113) on reference level shaft (A2MP86) with small end of spring down (toward brass drive hub). Place ball bearing on small spring in double-contact (ref level) rotor (A2MP81).

l. Place IF gain detent (A2MP69), with fixed lockout (A2MP78) attached over three long screws with fixed lockout facing outward. Hold in position and secure with three 4-40 nuts (do not use lockwashers). Make sure IF gain detent (A2MP69) is properly aligned to allow free movement of reference level shaft (A2MP86) before tightening the three 4-40 nuts.

m. Looking at the INPUT ATTEN switch from front and top of A2A1 Front Switch Assembly, the double-contact (attenuator) rotor (A2MP80) should be positioned so its stop pin is on the right side of stop tab of attenuator detent (A2MP68). Looking at REF LEVEL (IF gain) switch from rear side of A2A1 Front Switch Assembly, the double-contact (ref level) rotor should be positioned so its stop pin is on the right side of stop tab of IF gain detent (A2MP69).

n. Turn switch assembly front side down and make sure front brass drive hub (A2MP74) is as close as it can be to brass bushing in attenuator detent (A2MP68). Temporarily tighten one set screw in front brass drive hub (A2MP74) and turn switch assembly over (front side up). Keeping front brass drive hub as close as possible to brass bushing in attenuator detent, loosen set screw in front brass drive hub and position so drive hub pin is centered over second slot from long dowel pin in double-contact (attenuator) rotor (A2MP80). Tighten both set screws in front brass drive hub (A2MP74).

CAUTION

If set screws in knob are tightened too much, hollow reference level shaft (A2MP86) will collapse and be ruined.

o. Using one of large knobs (from front panel), turn switch shaft to test mechanical ease of movement over full range of each switch. Switch should move in and out freely with spring action and should rotate freely with control pushed in or not pushed in.

p. Place rotating lockout (A2MP77) over reference level shaft (A2MP86) on rear side of A2A1 Front Switch Assembly with small pin on fixed lockout (A2MP78) centered between teeth of rotating lockout. Tighten setscrews in rotating lockout.

q. Place one 22mm (7/8 inch) spacer on each long screw: Place fixed shaft (A2MP87), with slotted crank (A2MP71) attached to it,

through hollow reference level shaft (A2MP86) with slot of slotted crank slid over large pin on fixed lockout (A2MP78).

r. Place A2A5 Reference Level Encoder Assembly (rotor side toward A2A1 Front Switch Assembly) over three long screws. Place one 8mm (5/16 inch) spacer on each long screw.

s. Set A2R1 REF LEVEL FINE potentiometer fully counterclockwise (use small knob from front panel controls if necessary). Place level pot plate (A2MP70), with potentiometer A2R1 attached, over three long screws. Secure with three lock washers and 4-40 nuts.

t. Set PC rotor assembly (A2A5MP1) so fingers contact encoder PC board at arrow labeled "o". Tighten two set screws closest to PC rotor assembly (A2A5MP1) in rotory switch hub (A2A5MP2).

u. Insert reference level fine shaft (A2MP67) from front side of switch assembly as far as it will go. Tighten remaining two set screws in rotory switch hub (A2A5MP2). Solder three leads from REF LEVEL FINE potentiometer to A2A1 Front Switch Assembly PC board (color codes of wires are etched on PC board).

8-30. Sub-front Panel and Front Dress Panel Attachment.

a. Place 1/4-28 bushing over sweep time control shaft (A2A4MP3) so threaded portion is toward front of switch assemblies. Place switch assemblies over sub-front panel and fasten A2A1 Front Switch Assembly to sub-front panel using ten 4,75 mm (3/16 inch) 4-40 panhead screws (A2MP143 through 152).

b. Place 19 mm (3/4 inch) spacer (A2MP105) between A2A1 Front Switch Assembly and A2A4 Rear Switch Assembly (see Figure 8-1). Place 25 mm (1 inch) 4-40 panhead screw (A2MP92) with lock washer through A2A4 Rear Switch Assembly, spacer (A2MP105), and A2A1 Front Switch Assembly. Tighten screw.

c. Solder the five wires from A2A4 Rear Switch Assembly to A2A5 Reference Level Encoder assembly (color codes of wires are etched on PC board).

d. Place front dress panel over control shafts, pushbuttons, and LEDs.

e. Place input attenuator pointer (A2MP9) over brass bushing on REFERENCE LEVEL control. Fasten with 3/8-32 nut with collar. Align input attenuator pointer (A2MP9) so collar of 3/8-32 nut slips down through pointer.

f. Place 3/8 inch lockwasher and 8/8-32 nut over brass bushing on FREQ SPAN/DIV control and tighten nut.

g. Place 1/4-28 bushing (on SWEEP TIME/DIV control shaft) through sub-front and front dress panels. Fasten with 1/4 inch lock washer and 1/4-28 nut.

h. Set sweep time rotor (A2A4MP4) by turning 48 tooth spur gear (A2A4MP13) until fingers contact PC board at arrow labled "10 ms".

i. Place SWEEP TIME/DIV knob on SWEEP TIME/DIV control and tighten set screws with knob set to 10 mSEC.

j. Place coarse tuning knob on TUNING control and tighten set screws. Place FINE tuning knob on TUNING control leaving a slight amount of space between coarse tuning knob and FINE tuning knob. Tighten set screws.

k. Place frequency span/div knob on FREQUENCY SPAN/DIV control and tighten one set screw. Turn FREQUENCY SPAN/DIV control fully clockwise. Loosen set screw and set knob to indicate a FREQUENCY SPAN/DIV setting of "F" (full span). Tighten set screws.

l. Place RES BW knob on RESOLUTION BW control leaving a slight amount of space between frequency span/div knob and RES BW knob. Tighten one set screw and turn RESOLUTION BW control fully clockwise. Loosen set screw and set RES BW knob so OPTIMUM arrows (green) are aligned. Tighten set screws.

m. Place large knob on REFERENCE LEVEL control and tighten one set screw. Turn control fully clockwise. Push knob in and again turn fully clockwise. Loosen set screw. Hold slotted crank (A2MP71) against fixed lockout (A2MP78) at rear of switch assemblies. Place

black index disc (A2MP10) over front end of fixed shaft with REF LEVEL dBm window toward top of front panel. Secure index disc (A2MP10) with small retaining ring.

n. Pull large knob away from front dress panel until index disc is properly seated in the recess of the large knob. Turn knob so −90 appears in REF LEVEL dBm window and tighten set screws.

o. Place REF LEVEL FINE knob on REF LEVEL FINE control and tighten one set screw. Turn REF LEVEL FINE control fully counterclockwise. Loosen set screw and set REF LEVEL FINE knob for an indication of 0 (centered under REF LEVEL dBm window). Tighten set screws.

p. Turn three small shafts (PRESELECTOR PEAK, MANUAL SWEEP, and TRIGGER LEVEL) fully clockwise. Place small knob on MANUAL SWEEP control and position so mark on small knob points to last mark on front dress panel (approximately 5 o'clock). Tighten set screws. Place small knobs on PRESELECTOR PEAK and TRIGGER LEVEL controls. Position each small knob so mark points to same relative position as setting for MANUAL SWEEP control. Tighten set screws.

SERVICE SHEET 1

MODEL 8565A SPECTRUM ANALYZER, OVERALL CIRCUIT DESCRIPTION

Figure 8-4 shows the overall block diagram of the Model 8565A Spectrum Analyzer. This is a simplified block diagram and is not intended to show every input to, or output from, a particular assembly. Some of the direct lines between assemblies might actually be routed through switches in other assemblies. For example, the SWEEP line is shown as a direct connection betwen A16 Sweep Generator and A6 X Deflection Amplifier, but the actual signal path is through A2 Front Panel Control Assembly and A10 Display Motherboard.

The overall block diagram is divided into three sections: RF, IF, and Display. Signal paths through A29 RF-IF Motherboard and A10 Display Motherboard are not shown.

Brief descriptions of the assemblies are presented in the same order as the related schematics appear in this manual. Refer to the indicated service sheets for complete circuit descriptions.

A2 Front Panel Control Assembly
(Service Sheet 5)

A2 Front Panel Control Assembly includes the following subassemblies: A2A1 Front Switch Assembly, A2A2 Frequency Display Assembly, A2A3 Tuning Assembly, A2A4 Rear Switch Assembly, and A2A5 Reference Level Encoder Assembly.

For operational descriptions of the front-panel controls, see Section III. The functional description of a control, as it affects a specific assembly, is given in the circuit description of that assembly.

A34 RF Attenuator Assembly
(Service Sheet 6)

A34 RF Attenuator Assembly receives a signal from the INPUT 50Ω connector on the front panel. The front-panel INPUT ATTEN control selects the amount of attenuation (0 dB to 70 dB in 10 dB steps) of the input signal.

A33 Limiter
(Service Sheet 6)

When the FREQUENCY BAND GHz switch is set to .01 — 1.8, A33 Limiter and 1.8 GHz Low-Pass Filter FL3 are switched into the signal path by the activation of Coax Switches K2 and K1. The Limiter protects A30 First Mixer Assembly from excessive input power.

A32 YIG-Tuned Filter Assembly
(Service Sheet 6)

The signal path is normally through A32 YIG-Tuned Filter (YTF) Assembly, 3-dB Attenuator AT3, and 6-dB Attenuator AT4 to A30 First Mixer Assembly except when the FREQUENCY BAND GHz setting .01 — 1.8 is selected. The YTF is used as a preselector on the analyzer for the FREQUENCY BAND GHz settings covering 1.7 to 22 GHz. Its purpose is to reduce image, multiple, and spurious responses.

A30 First Mixer Assembly
(Service Sheet 6)

A30 First Mixer Assembly mixes the .01 to 22 GHz input signal with the 2.0 to 4.46 GHz first LO signal from A31 YIG-Tuned Oscillator Assembly (YTO). The mixer utilizes fundamental mixing for the two lowest frequency bands and harmonic mixing, with N = 2, 3, 4, or 5, for the other frequency bands. The output is 2050 MHz IF for the FREQUENCY BAND GHz setting .01 – 1.8 and 321.4 MHz IF for the other internal mixing bands. The First Mixer is used only to couple the LO into the external mixer line when external mixing is used.

A31 YIG-Tuned Oscillator Assembly
(Service Sheet 6)

A31 YIG-Tuned Oscillator Assembly (YTO) is used as the first LO in the analyzer. It is a transistor oscillator with a YIG sphere as the resonator. The YTO is tuned by inputs from A19 YIG Driver Assembly and A14 Tuning Stabilizer Control Assembly. The 2.0 to 4.46 GHz output signal goes to A30 First Mixer Assembly.

A35 Second Converter Assembly
(Service Sheet 7)

A35 Second Converter Assembly includes three subassemblies: A35A1 Second Converter Oscillator Housing Assembly, A35A1A1 Second Converter Oscillator Assembly, and A35A2 Second Converter Voltage Filter Assembly. It also includes a 2050 MHz bandpass filter. The Second Converter receives a signal from A30 First Mixer (through the 2050-MHz Low-Pass Filter FL2) or from the External Mixer (through the 2.05 — 4.1 GHz Isolator AT1 and FL2), depending on the position of Coax Switch K3. Its input is 2050 MHz IF, and its output is 321.4 MHz IF. When Coax Switches K5 and K4 are not activated, the Second Converter is bypassed, and the control line from A13 Relay Driver Assembly to A35A2 Voltage Filter Assembly is open, turning off the Second Converter oscillator. The Second Converter is used only for FREQUENCY BAND GHz settings of .01 — 1.8, 14.5 — 26.6, and 22.9 — 40.

A37 Third Converter Assembly
(Service Sheet 8)

A37 Third Converter Assembly amplifies and down-converts to 21.4 MHz the 321.4 MHz signal from Coax Switch K4. It also contains circuitry to provide the CAL OUTPUT signal at the front panel and circuitry for signal identification. It includes three subassemblies: A37A1 Third Converter Amplifier, A37A2 Third Converter Mixer, and A37A3 Third Converter Oscillator. It also includes a 321.4 MHz bandpass filter and a 300 MHz bandpass filter.

A13 Relay Driver Assembly
(Service Sheet 9)

The Relay Driver controls Coax Switches K1 through K5, depending on the FREQUENCY BAND GHz selected, and provides a means to identify a displayed signal by controlling the frequency of the local oscillator in A37 Third Converter Assembly.

A16 Sweep Generator Assembly
(Service Sheet 10)

A16 Sweep Generator Assembly contains circuits which trigger and generate a −5V to +5V linear ramp that horizontally sweeps the CRT display. The sweep voltage is also processed in A15 Sweep Attenuator Assembly to sweep the analyzer frequency.

A15 Sweep Attenuator Assembly
(Service Sheet 11)

A15 Sweep Attenuator Assembly attenuates the sweep ramp from A16 Sweep Generator Assembly to provide the different frequency span widths as selected by the FREQUENCY SPAN/DIV and FREQUENCY SPAN MODE switches, and there is circuitry to control the Auto Sweep Time (AST). The attenuated sweep ramp goes to A17 Frequency Control Assembly for wide frequency spans and to A14 Tuning Stabilizer Control Assembly for narrow frequency spans.

A17 Frequency Control Assembly
(Service Sheet 12)

A17 Frequency Control Assembly contains circuits for controlling and displaying the frequency to which the analyzer is tuned. It is controlled by the TUNING, FREQUENCY BAND GHz and FREQUENCY SPAN MODE controls on the front panel. The main input is the attenuated sweep from A15 Sweep Attenuator Assembly. The three main outputs are voltages proportional to YTO frequency, YTF frequency, and center frequency.

A18 Full Multiband Assembly
(Service Sheet 13)

A18 Full Multiband Assembly contains circuits for spectrum analyzer operation in the full band modes of FULL BAND and PER DIV F (FREQUENCY SPAN/DIV in F) and also in the multiband mode 1.7 — 22 GHz SPAN. There is also circuitry to control the Auto Sweep Time (AST) and to generate a marker for the full band and multiband modes, and a circuit for oversweep blanking in the PER DIV mode.

A19 YIG Driver Assembly
(Service Sheet 14)

A19 YIG Driver Assembly contains circuits that tune A31 YIG-Tuned Oscillator (YTO) Assembly and A32 YIG-Tuned Filter (YTF) Assembly. It receives voltages proportional to the YTO and YTF frequencies from A17 Frequency Control Assembly. The PRESELECTOR PEAK control varies an offset voltage in the YTF driver to control the tracking of the YTF to the YTO.

A14 Tuning Stabilizer Control Assembly
(Service Sheet 15)

A14 Tuning Stabilizer Control Assembly contains circuits that tune the Tickler Coil of the A31 YIG-Tuned Oscillator Assembly. A14 Tuning Stabilizer Control Assembly and A36 Tuning Stabilizer Assembly function together as a Tuning Stabilizer System, which is described on Service Sheet 15.

A36 Tuning Stabilizer Assembly
(Service Sheet 16)

A36 Tuning Stabilizer Assembly is used only in the AUTO STABILIZER mode. This assembly comprises three subassemblies: A36A1 Discriminator Assembly, A36A2 VCXO Assembly, and A36A3 Sampler Assembly. Additional control circuitry for the tuning stabilizer operation is in A14 Tuning Stabilizer Control Assembly.

A12 DVM Analog Assembly
(Service Sheet 17)

A12 DVM Analog Assembly processes the analog input voltage (center frequency) to provide A11 DVM Digital Assembly with a time interval proportional to the input voltage. It also generates control signals for some FET analog switches in the assembly.

A11 DVM Digital Assembly
(Service Sheet 18)

A11 DVM Digital Assembly includes most of the circuitry for time measurement and control of A12 DVM Analog Assembly, and it provides drive for the center frequency (FREQUENCY GHz) display, data for the bezel FREQUENCY display, and the clock for the rest of the bezel display.

A20 Bias Assembly
(Service Sheet 19)

A20 Bias Assembly biases the mixer diode in A30 First Mixer Assembly, as a function of FREQUENCY BAND GHz selected, and it controls the gain of A28 Variable Gain Assembly to compensate for changes in RF signal loss as a function of frequency.

A28 Variable Gain Assembly
(Service Sheet 20)

A28 Variable Gain Assembly has four functions: It amplifies the 21.4 MHz signal from A37 Third Converter Assembly, it varies gain (or attenuation) to compensate for changes in conversion efficiency and RF signal loss as a function of frequency, it provides variable gain for reference level calibration, and it provides attenuation for the signal identification function.

A27 Bandwidth Filter No. 1 Assembly
(Service Sheet 21)

A27 Bandwidth Filter No. 1 Assembly operates at 21.4 MHz and is variable in bandwidth from 3 MHz to 1 kHz. The front-panel RESOLUTION BW switch is used to select one of eight available bandwidth settings. The narrower bandwidths are obtained from four synchronously tuned crystal filters; the four wider bandwidths, from four synchronously tuned LC tank circuits. The four stages of bandwidth filters are on two similar printed-circuit boards, A27 Bandwidth Filter No. 1 Assembly and A23 Bandwidth Filter No. 2 Assembly. (Two LC tank circuits and two crystal filters are on each board.)

A24 Step Gain Amplifier Assembly
(Service Sheet 22; For Option 100, see Service Sheet 39)

A24 Step Gain Amplifier amplifies the 21.4 MHz signal originating in A37 Third Converter Assembly. The amplifier stages are selected by the front-panel REFERENCE LEVEL switch. A24 Step Gain Amplifier Assembly also contains the circuitry for the 0 to 12 dB of attenution as controlled by the front-panel REFERENCE LEVEL FINE control.

A23 Bandwidth Filter No. 2 Assembly
(Service Sheet 23)

A23 Bandwidth Filter No. 2 Assembly is almost identical to A27 Bandwidth Filter No. 1 Assembly. The differences are described on Service Sheet 23.

A22 Log Amplifier Assembly
(Service Sheet 24)

A22 Log Amplifier Assembly provides the ability to display signals in either a linear mode or log mode. It also operates with A24 Step Gain Amplifier Assembly to provide the last 40 dB of step gain amplification of the 21.4 MHz IF signal.

A21 Video Assembly
(Service Sheet 25; For Option 100, see Service Sheet 40)

A21 Video Assembly filters the detected signal from A22 Log Amplifier Assembly as selected by the VIDEO FILTER and RESOLUTION BW switches. It scales the amplitude according to the AMPLITUDE SCALE selected at the front panel. It also controls A23 and A27 Bandwidth Filter Assemblies to determine selection of RESOLUTION BW, and it varies the Auto Sweep Time according to VIDEO FILTER and RESOLUTION BW settings.

A1 Front Panel Display Assembly
(Service Sheet 27)

A1 Front Panel Display Assembly includes A1A1 Bezel Display Assembly and A1A2 Display Switch Assembly. The Bezel Display Assembly provides information, in the form of LED displays above and below the CRT, about the front-panel control settings of the spectrum analyzer. The Display Switch Assembly provides the switches and potentiometers controlling the CRT display.

A3 Display Adjust Assembly
(Service Sheet 27)

A3 Display Adjust Assembly includes the front-panel screwdriver adjustments ASTIG, TRACE ALIGN, HORIZ POSN, and VERT POSN. The ASTIG adjustment is discussed in the circuit description of A8 High Voltage Power Supply Assembly; TRACE ALIGN, A7 Storage Assembly; HORIZ POSN, A6 X Deflection Amplifier Assembly; and VERT POSN, A5 Y Deflection Amplifier Assembly.

A6 X Deflection Amplifier Assembly
(Service Sheet 28)

A6 X Deflection Amplifier Assembly receives inputs from the front-panel HORIZ POSN adjustment and A16 Sweep Generator Assembly to provide a horizontal deflection signal to the CRT.

A5 Y Deflection Amplifier Assembly
(Service Sheet 29)

A5 Y Deflection Amplifier Assembly receives inputs from the front-panel VERT POSN adjustment, A21 Video Assembly, and A7 Storage Assembly to provide a vertical deflection signal to the CRT.

A4 Z Axis Amplifier Assembly
(Service Sheet 30)

A4 Z Axis Amplifier Assembly performs all CRT blanking functions and controls intensity. It receives inputs from the front-panel INTENSITY and BASELINE CLIPPER controls, A21 Video Assembly, A18 Full Multiband Assembly, A16 Sweep Generator Assembly, and A7 Storage Assembly. It provides the gate voltage to A8 High Voltage Power Supply Assembly to control blanking and intensity of the CRT.

A7 Storage Assembly
(Service Sheet 31)

A7 Storage Assembly controls the storage portions of the CRT and in addition controls orthogonality and pattern. It also contains circuitry which controls the interaction between the PERSIST and INTENSITY controls.

A8 High Voltage Power Supply Assembly
(Service Sheet 32)

WARNING

Because of the high voltages found in this assembly, servicing should be accomplished only by qualified personnel.

A8 High Voltage Power Supply Assembly provides operating potentials for the CRT. These include −3000V for the cathode, approximtely −3050V for the intensity grid, +7000V for the post accelerator (by way of High Multiplier U1), −50V for CRT controls, and approximately −2000V for focus.

A9 High Voltage Oscillator Assembly
(Service Sheet 32)

A9 High Voltage Oscillator Assembly provides a 40 kHz sine wave to drive the high voltage transformer and senses the CRT cathode voltage to maintain the cathode at −3000V in conjunction with A8 High Voltage Power Supply Assembly.

A38 Readout Input Assembly
(Service Sheet 34)

A38 Readout Input Assembly accepts switch code patterns from front-panel controls and time multiplexes them. Some logical manipulation is performed to make the code patterns more useful. Seven groups of inputs, derived from front-panel control codes, are scanned in a sequence determined by A39 Readout Driver Assembly and are sent to that assembly via the six-line MX bus.

A39 Readout Driver Assembly
(Service Sheet 35)

A39 Readout Driver Assembly provides drive for A1A1 Bezel Display Assembly. There are three distinct groups of drivers on the board. The first accepts information about front-panel control settings and drives the corresponding 16 digits (see A38 Readout Input Assembly). The second accepts information about the center frequency and drives the six center frequency digits. The third provides dc for annunciators.

A40 Power Supply Assembly
(Service Sheet 36)

A40 Power Supply Assembly is made up of two subassemblies: A40A1 Rectifier Assembly and A40A2 Regulator Assembly. The Rectifier converts the voltages from the transformer secondary to unregulated voltages. These unregulated voltages are then regulated and distributed to the rest of the instrument by the Regulator Assembly. All regulators are feedback type with current limit over-voltage crowbar circuits.

A41 Line Module and Cable Assembly
(Service Sheet 36)

A41 Line Module and Cable Assembly provides line voltage to Power Transformer T1. The assembly consists of the filtered line module and the front-panel LINE switch.

OPTION 100

A25 UP-Down Converter Assembly (Option 100)
(Service Sheet 37)

A25 Up-Down Converter Assembly converts the 21.4 MHz IF (from A27 Bandwidth Filter No. 1 Assembly) down to a 3 MHz IF so that it can be filtered by A26 3 MHz Filter Assembly. It then converts the filtered 3 MHz IF back up to 21.4 MHz. Since Q is equal to center frequency divided by bandwidth, the use of 3 MHz to shape the most narrow bandwidths (100 Hz, 300 Hz, and 1 kHz) allows a design with crystals of more feasible Q.

A26 3 MHz Filter Assembly (Option 100)
(Service Sheet 38)

A26 3 MHz Filter Assembly provides filtering for the bandwidths 1 kHz, 300 Hz, and 100 Hz. The 21.4 MHz IF from A27 Bandwidth Filter No. 1 Assembly is down-converted to 3 MHz in A25 Up-Down Converter Assembly. After filtering, the 3 MHz IF is up-converted to 21.4 MHz in A25 and sent to A24 Step Gain Amplifier/Oscillator Assembly.

A24 Step Gain Amplifier/Oscillator Assembly (Option 100)
(Service Sheet 39)

A24 Step Gain Amplifier/Oscillator Assembly amplifies the 21.4 MHz signal originating in A37 Third Converter Assembly. The amplifier stages are selected by the front-panel REFERENCE LEVEL switch. A24 also contains the circuitry for the 0 to 12 dB of attenuation as controlled by the front-panel REFERENCE LEVEL FINE control. An 18.4 MHz oscillator is provided in this assembly for use only in the 1 kHz, 300 Hz, and 100 Hz bandwidths. This LO signal is used in the Up-Down Converter Assembly.

A21 Video–100 Hz Assembly (Option 100)
(Service Sheet 40)

A21 Video Assembly filters the detected signal from A22 Log Amplifier Assembly as selected by the VIDEO FILTER and RESOLUTION BW switches. It scales the amplitude according to the AMPLITUDE SCALE selected at the front panel. It also controls A23 and A27 Bandwidth Filter Assemblies to determine selection of RESOLUTION BW, and it varies the Auto Sweep Time according to VIDEO FILTER and RESOLUTION BW settings.

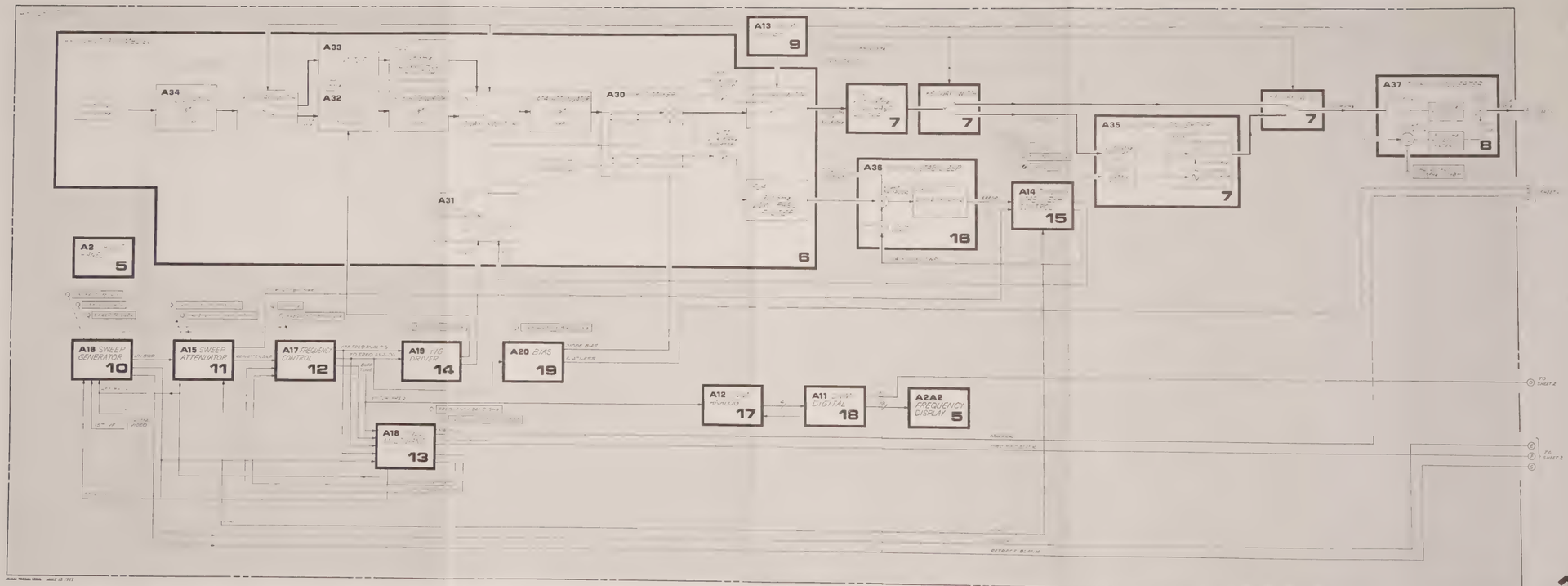


Figure 8-4. Overall Block Diagram (1 of 2)

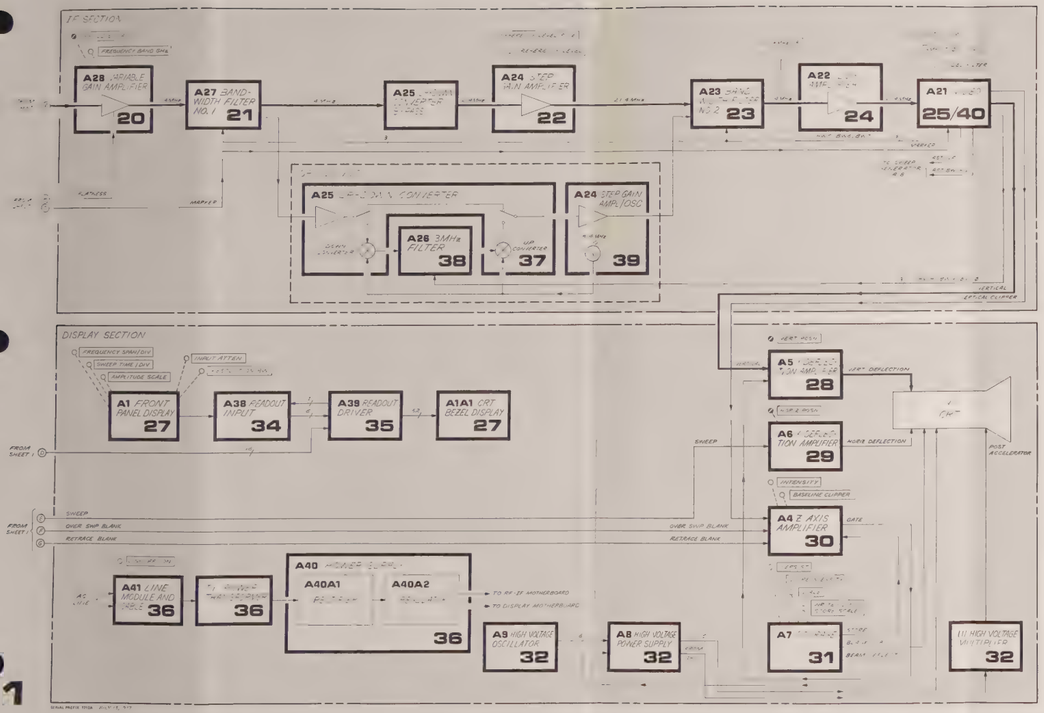
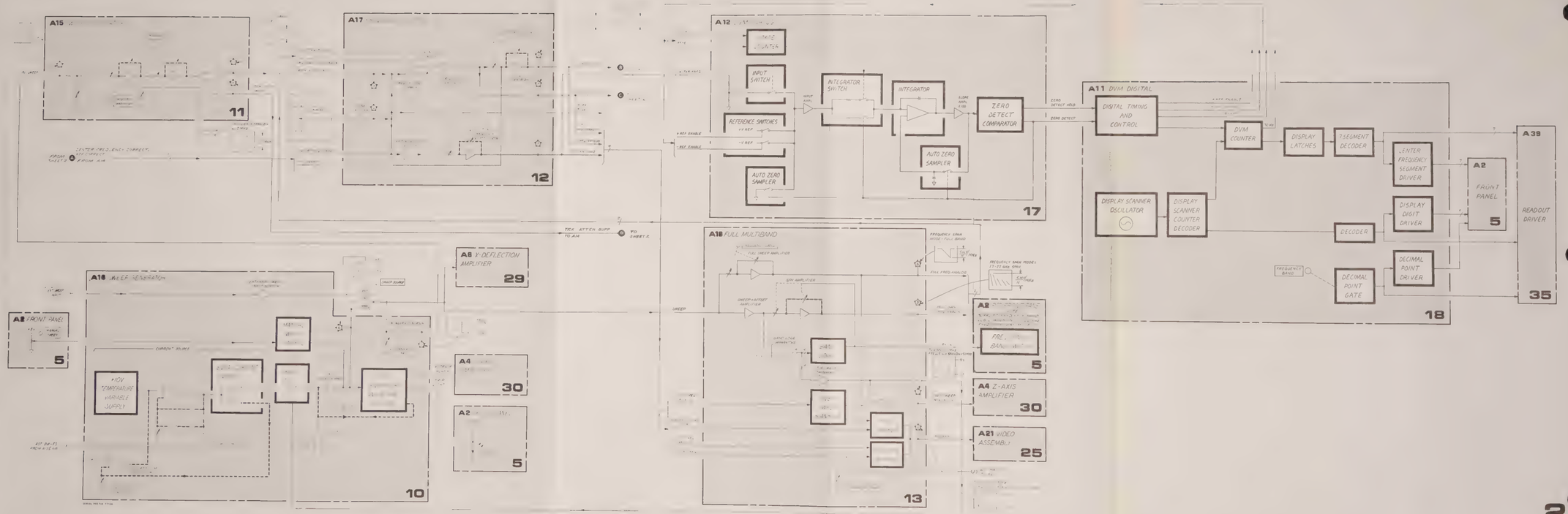


Figure 8-4. Overall Block Diagram (2 of 2)



Overall Block Diagram
SERVICE SHEET 1

Figure 8-5. RF Block Diagram (1 of 2)

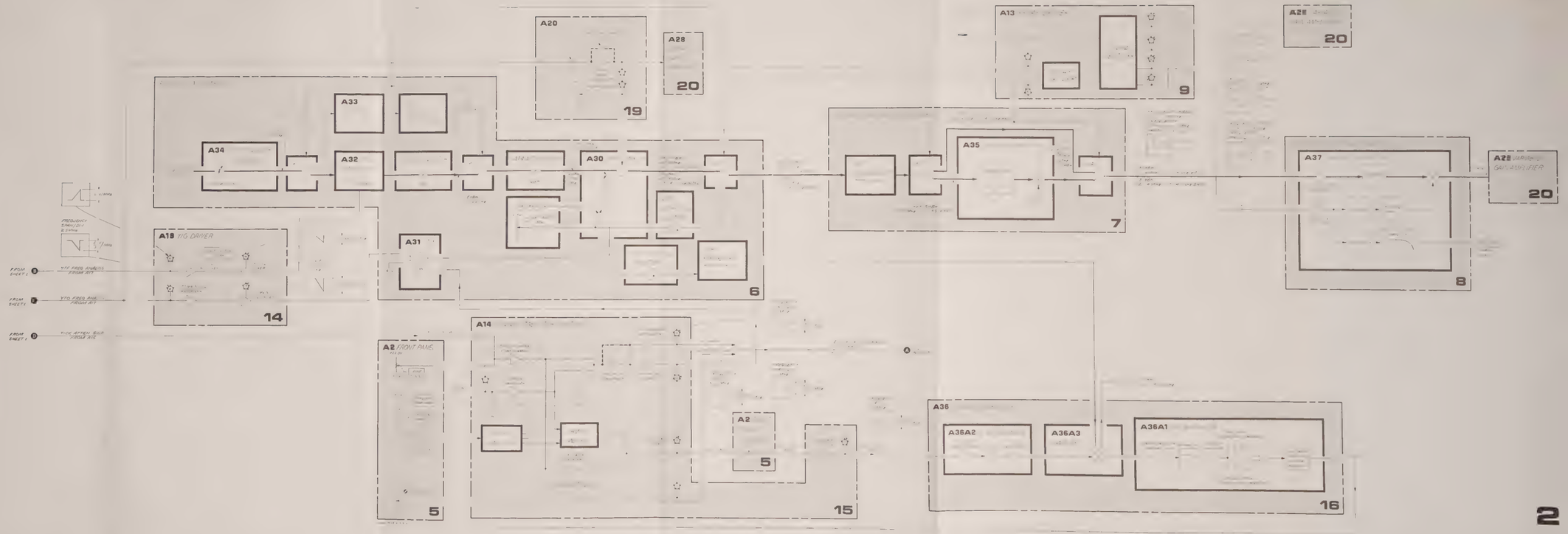


Figure 8-5. RF Block Diagram (2 of 2)

RF Block Diagram
SERVICE SHEET 2

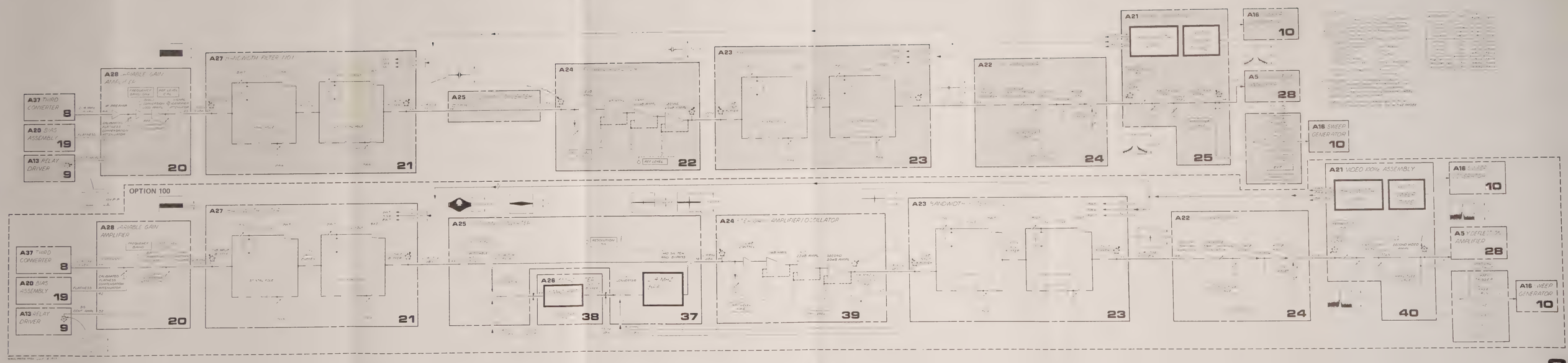


Figure 8-6. IF Block Diagram

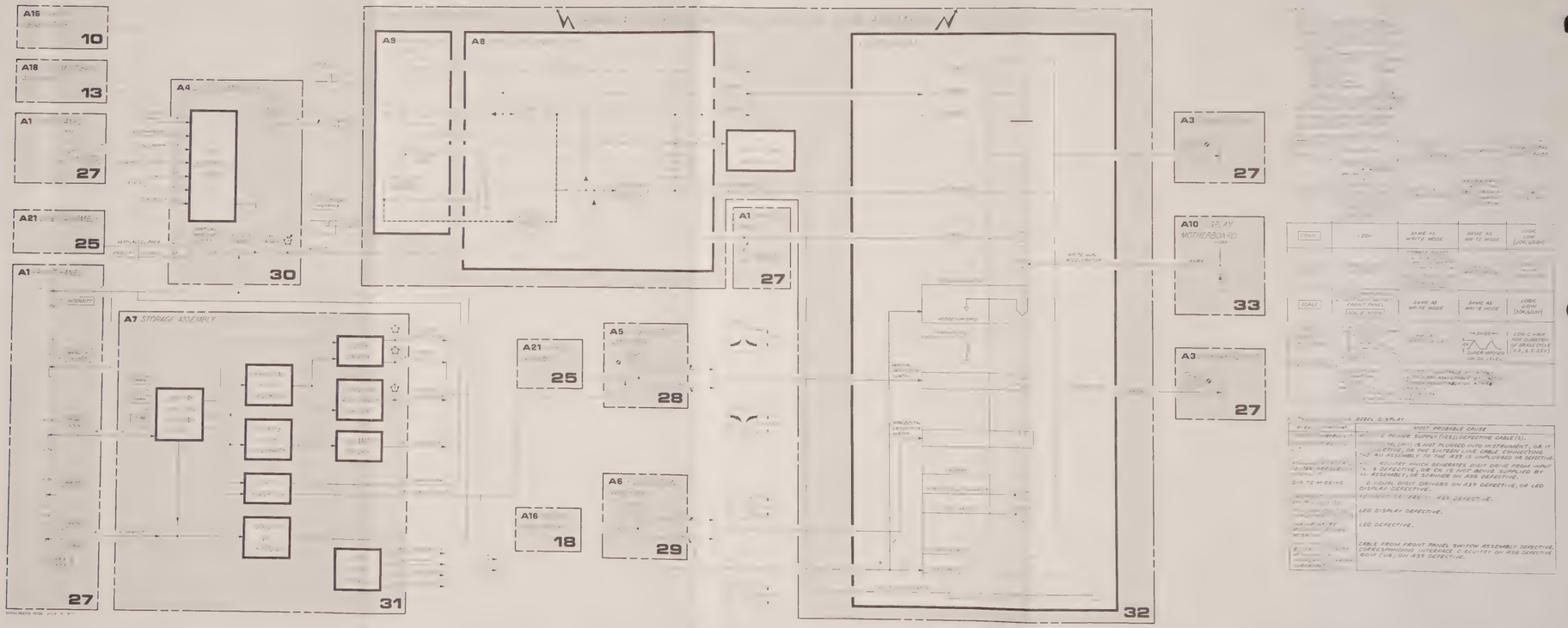


Figure 8-7. Display Block Diagram (1 of 2)

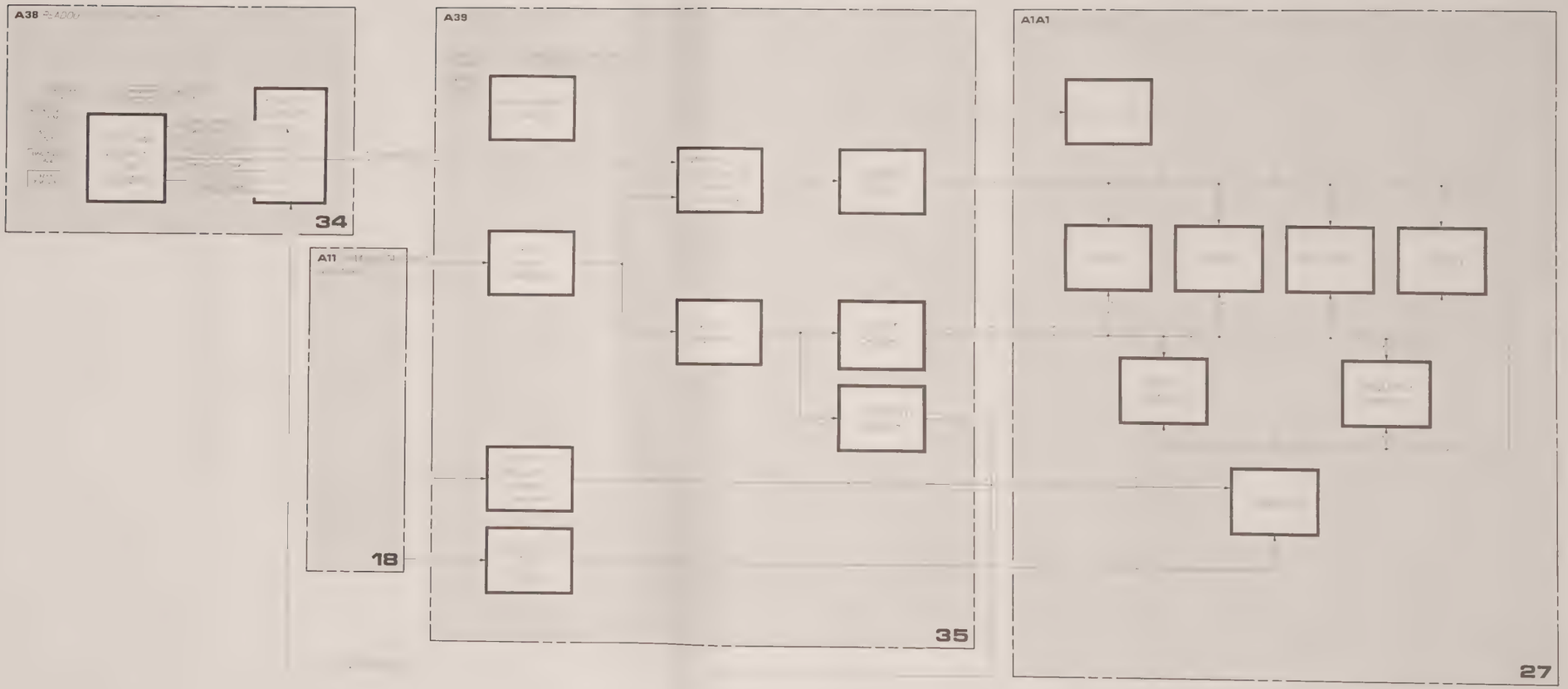


Figure 8-7. Display Block Diagram (2 of 2)

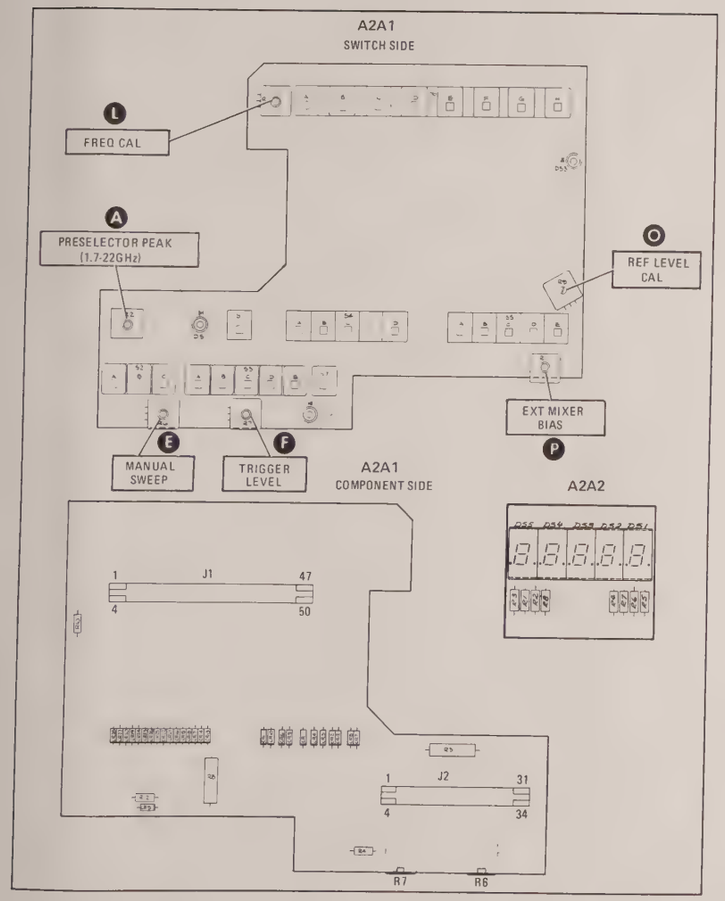


Figure 8-8. A2A1 Front Switch Assembly and A2A2 Frequency Display Assembly, Component Locations

A2 08565-

A2A1J1

	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NARROW	A15P1-30, A16P1-42, A38J5-1 / A16P1-42, A19P1-15	G
2	B6	A15P1-30, A15P2-20, A17P1-25 / A16P1-30, A20P2-20, RP1-5	K
3	B5	A15P1-13, A15P1-9, A17P1-9, A16P1-19 / A20P1-19, A28P1-40, RP1-5	K
4	B7	A17P1-19, A17P1-14, A16P1-29 / A17P1-21, A16P1-21	K
5	ZERO	A38J3-5, A16P1-29	H
6	B8	A11P1-15, A15P1-15, A16P1-31 / A17P1-22, A16P1-23	K
7	B4	A16P1-18, A17P1-18, A16P2-30 / A20P1-18, A28P1-39, RP1-3	K
8	FG6	A22P1-40, A38J3-8	M
9	MULTIBAND	A38J3-9, A17P1-40, A16P1-40, A16P1-40	H
10	FG5	A22P1-39, A38J3-10	M
11	B3	A16P1-17, A17P1-17, A16P1-17, A20P1-17, A28P1-38, RP1-3	K
12	FG4	A22P1-38, A38J3-12	M
13	FULL	A38J3-13, A15P1-27, A16P1-39 / A17P1-39, A16P1-39	H
14	FG3	A22P1-37, A38J3-14	M
15	B2	A17P1-15, A16P1-16, A16P1-16 / A20P1-16, RP1-2	K
16	FG2	A22P1-36, A38J3-16	M
17	B1	A15P1-8, A16P1-15, A16P1-15, A17P1-16 / A16P1-15, A20P1-15, RP1-1	K
18	FG1	A22P1-35, A38J3-18	M
19	MAN SWP	A16P1-38, A38J3-19	G
20	FS F2.5	A15P1-11, A16P2-1, A38J3-20	G
21		A38P1-10, A38J3-2	N
22		A15P1-12, A16P2-2, A38J3-22	G
23		A38J3-23, A38P1-9	N
24		A15P1-13, A16P2-3, A38J3-24	G
25			N
26			G
27	SE		N
28			G
29			N
30			G
31	SE		N
32			G
33			N
34	+26V UNREG		N
35	-15V	A38J3-35, A40A2J2-15 (97)	NOT USED
36	2dB/dB	A38P1-5, A38J3-36	N
37	2dB/DIV	A38J3-37, A21P1-33	J
38	+15V	A38J3-30, A40A2J2-11 (92)	NOT USED
39		A21P1-32, A38J3-39	J
40	2dB	A38P1-11	N
41	0dB/DIV	A21P1-31, A38J3-4	J
42			
43	VC		
44	VC		
45	BW0	A21P1-13, A38J3-45	H
46	NC		
47	BW4	A21P1-17, A38J3-47	H
48	ST FAST	A16P1-37, A38J3-48, A24AJ1-16	C
49	LOG/LIN	A22P1-31	J
50	ST CAL	A16P1-36, A38J3-50, A24AJ1-18	C

A2A1J2

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	+15V	A40A2J2-11 (92)	W
2	VIDEO TRIG	A21P1-30	D
3	LINE TRIG	A40A2J2-4 (90)	D
4	▽	A29	W
5	-15V2	A40A2J2-15 (97)	W
6	LINE TRIG	A16P1-23	D
7	TRIG	A16P1-43	D
8	EXT	A16P1-9	L
9	+5V	A40A2J2-10 (95)	W
10	SWP SPEED	A28P1-36, A32R6, A29R6	G
11		A29	W
12	TRIG HOLD	A16P2-10	F
13	EXT SWP	A16P1-10	C
14	TRIG	A16P2-9	D
15	BW COM	A2A4J1-7, A1 (97)	H
16	SWP LIGHT	A16P2-8	J
17	FINE W	A29P1-41 (A29R7)	R
18	MAN SWP LEVEL	A16P2-7	E
19	FINE CW	A24P1-40	R
20	PRESELECT PEAK	A19P1-12	A
21	BW4X	A24AJ1-23	H
22	NC		
23	BW0X	A24AJ1-25	H
24	FMB VP	A21P1-29	H
25	EFT MIX BIAS	A30 (98)	P
26	NC		
27	INT SWP	A16P1-8	C
28	NC		
29	SWEEP	A16P1-9, A16P1-32, A19P1-13 A16R45, A29R10	C
30	-10VTV	A22P1-8	J
31	1MHz/DIV	A15P1-11	H
32	+15V2	A40A2J2-11 (92)	W
33	FREE RUN	A16P1-44	D
34	ATTEN EXT TRIG	A29A4	D

A2A3P1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
2	NC		
3	NC		
4	+22.3V REF	A17P1-10 (93)	S
5	+10V REF	A17P1-9 (94)	S
6	TUNE	A17P1-32 (95)	S
7	FINE TUNE	A16P1-9 (96)	S
8	VCXO SWP	A16P1-12 (97)	S
9	2nd VCXO SWP	A16P1-13 (98)	S
10	NC		

A2A2J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	NC		
2	CFD1	A11J2-2	O
3	CFD9	A11J2-3	O
4	CFD8	A11J2-4	O
5	CFD7	A11J2-5	O
6	NC		
7	CFD6P	A11J2-7	O
8	CFD6	A11J2-8	O
9	CFD5	A11J2-9	O
10	CFD3	A11J2-10	O
11			
12	CFD1	A11J2-12	O
13	CFD2	A11J2-13	O
14	CFD3	A11J2-14	O
15	CFD4	A11J2-15	O
16	CFD5	A11J2-16	O

A2A4J1

PIN	SIGNAL	TO/FROM	FUNCTION BLOCK
1	BW2	A21P1-15, A38J1-1	I
2	BW3	A21P1-16	I
3	BW1	A21P1-14, A38J1-3	I
4	BW8	A21P1-21, A26P1-36, A38J1-4	I
5	BW9	A21P1-22, A26P1-37	I
6	BWK	A38J1-6	I
7	BW COM	A2A1J2-15	I
8	STS	A38J1-8	V
9	NOT USED	A29J3-9	I
10	+5.2V	A38J1-10, A40A2J2-10 (95)	NOT USED
11	▽	A38J1-11, A29	V
12	STM	A38J1-12	V
13	STU	A38J1-13	V
14	+10VTV	A16P2-12, A38J1-14	NOT USED
15	GØ	A38J1-15	U
16	ST FAST	A16P1-37, A2A1J1-48	V
17	G1	A38J1-17	U
18	ST CAL	A16P1-36, A2A1J1-50	V
19	G2	A38J1-19	U
20	ST X100	A38J1-20, A16P1-14	V
21	G3	A38J1-21	U
22	ST X10	A38J1-22, A16P1-13	V
23	BW4X	A2A1J2-21	I
24	ST X5	A16P1-12, A38J1-24	V
25	BW0X	A2A1J2-23	I
26	ST X2	A38J1-24, A16P1-11	V

SERIAL PREFIX: 1712A JULY 22, 1977

Figure 8-9. A2 Front Panel Control Assembly, Schematic Diagram (1 of 2)

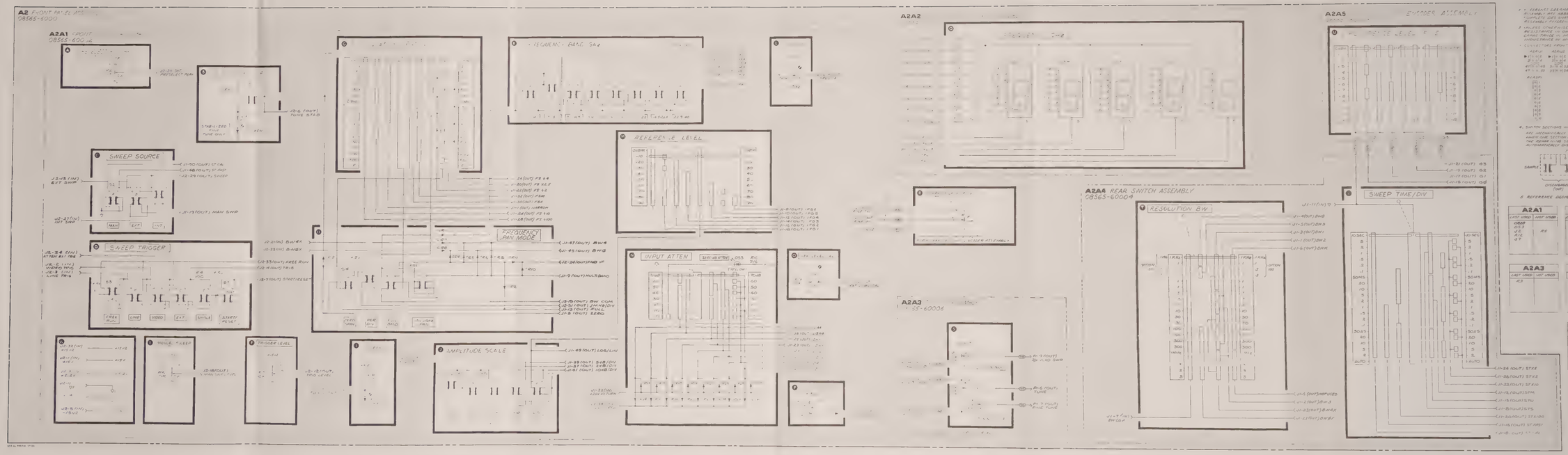


Figure 8-9. A2 Front Panel Control Assembly Schematic Diagram (2 of 2)

SERVICE SHEET 6
A30, A31, A32, A33, A34 RF INPUT ASSEMBLIES, CIRCUIT DESCRIPTION

CAUTION

While working with and around the semi-rigid coaxial cables connected to the RF Input Assemblies, do not bend the cables more than necessary. Do not torque the RF connectors to more than 2 inch-pounds. Be especially careful when working on the connectors on the First Mixer Assembly.

The RF Input Assemblies include A30 First Mixer Assembly, A31 YTO Assembly, A32 YTF Assembly, A33 Limiter, and A34 RF Attenuator Assembly, as well as three coax switches, two pads, two low-pass filters, and two isolators.

A34 RF Attenuator Assembly (A)

The RF Attenuator Assembly is an attenuator that is programmable from 0 dB to 70 dB in 10-dB steps. It consists of four attenuation sections that can be inserted or removed from the signal line by latching self-disconnecting relays. Three of the sections have 20-dB attenuation and the fourth, 10-dB attenuation over the frequency range from .01 to 22 GHz. There is a common control line to the relays (+26V UNREG), and each relay has two wires: one for switching an attenuation section in, and the other for switching it out. Switching is accomplished by grounding of the control lines. A switch associated with each relay opens the control line path after switching has occurred. Thus, the relay draws current only during the actual switching operation. The control lines for the attenuator are activated by the INPUT ATTEN control at the front panel.

Coax Switches K2 and K1 (B) (G)

K2 and K1 are dc to 22 GHz coax switches. For FREQUENCY BAND GHz .01 — 1.8, they switch the Limiter and the 1.8 GHz Low-Pass Filter into the signal line. For the other internal-mixing FREQUENCY BAND GHz settings, covering 1.7 to 22 GHz, the YTF Assembly is switched into the signal line. The control for these relays comes from the Relay Driver Assembly.

A33 Limiter (C)

The Limiter contains diodes which clamp the voltage on the signal line to protect the First Mixer diode from excessive power and peak voltage levels applied to the 50Ω INPUT of the analyzer. The Limiter is used only in FREQUENCY BAND GHz .01 — 1.8.

1.8 GHz Low-Pass Filter (D)

The 1.8 GHz Low-Pass Filter FL3 is used in FREQUENCY BAND GHz .01 — 1.8 to filter out signals above the frequency band range, reducing the level of the image and multiple responses in the analyzer. This filter needs to have good rejection at 2050 MHz, which is the first IF for this frequency band, to reduce baseline lift caused by an input signal at this frequency.

A32 YIG-Tuned Filter Assembly (E)

The YTF Assembly is used as a preselector in the analyzer for the internal-mixing FREQUENCY BAND GHz settings covering 1.7 to 22 GHz. Its purpose is to reduce image, multiple, and spurious responses. The YTF has three YIG spheres as the resonators (providing a 3-pole filter) with coupling to the spheres accomplished with coupling loops. The input coupling loop is connected to ground; thus, the filter is a short to ground for dc and low frequencies. The resonant frequency of the YIG spheres is proportional to the applied magnetic field, which is proportional to the current in the YTF Coil. The current in the coil (from the YIG Driver Assembly) is controlled to track the YTF frequency to the YTO (first LO) fundamental or harmonic frequency with a 321.4 MHz offset (see schematic Note 8).

6 dB and 3 dB Pads (F) (H)

The 6 dB pad AT4 provides isolation between the First Mixer Assembly and the YTF Assembly or the 1.8 GHz Low-Pass Filter. The 3 dB pad AT3 provides additional isolation between the YTF Assembly and the First Mixer Assembly. The isolation achieved by these pads improves the frequency response of the analyzer, but at a sacrifice in sensitivity.

Isolators AT2 and AT1 (J) (K)

The YTO signal is fed through the First Mixer Assembly, Isolator AT2, and the 4.9 GHz Low-Pass Filter before going to the Sampler in the Tuning Stabilizer Assembly. This isolator buffers the First Mixer Assembly from the Sampler for the first LO frequencies of 2 —4.5 GHz. The 2050 MHz IF signal from the external mixer goes through isolator AT1 and Coax Switch K3 to the Second Converter Assembly. The isolator buffers the high VSWR of the Second Converter Assembly at the First LO frequencies for the external mixer of 2.05 — 4.1 GHz.

4.9 GHz Low-Pass Filter (L)

The 4.9 GHz Low-Pass Filter FL4 is in the signal path between the First Mixer Assembly and the Sampler in the Tuning Stabilizer Assembly. Its function is to filter out the third harmonic of the YTO signal which is applied to the Sampler.

A30 First Mixer Assembly (I)

The First Mixer Assembly is a sealed microcircuit which is not field repairable. The unit mixes the .01 to 22 GHz input signals with the 2.0 to 4.46 GHz first LO signal from the YIG-Tuned Oscillator (YTO). Fundamental mixing is used for the two lowest frequency bands, and harmonic mixing (N = 2, 3, 4, and 5) is used for the other internal mixing bands.In harmonic mixing, the outputs are the sum and difference frequencies of the input and N times the LO. For some bands the sum frequency is used, and for others, the difference frequency. The mixing equation is:

$$f_S = Nf_{LO} \pm f_{IF}$$

The IF Frequency is 2050 MHz for the FREQUENCY BAND GHz setting of .01 — 1.8 and is 321.4 MHz for the other internal-mixing settings of 1.7 — 22. (See schematic Note 8 for FREQUENCY BAND GHz versus harmonic number N and IF frequency.) Conversion loss of the mixer is approximately 10 dB for fundamental mixing. The output of the YTO is coupled into both the internal mixer and the transmission path for the external mixer via internal directional couplers. In addition, the YTO signal is fed through the First Mixer Assembly to the Sampler in the Tuning Stabilizer Assembly via the isolator AT2 and the 4.9 GHz Low-Pass Filter. Internal mixer DIODE BIAS is supplied from the Bias Assembly. A different bias is used for each harmonic to provide optimum conversion loss and flatness for that particular harmonic mixing mode. External mixer bias is supplied from the front panel EXT MIXER BIAS adjustment through the First Mixer Assembly to the EXT MIXER connector at the front panel. Three different signals pass through the EXT MIXER port: the dc bias goes to the external mixer diode, the first LO goes to the mixer, and the 2050 MHz IF comes back from the external mixer through the First Mixer Assembly and through isolator AT1 and coax switch K3 to the Second Converter Assembly. In addition to mixer bias, the First Mixer Assembly requires both −10V and +10V for operation. These voltages supply power to the transistor buffer in the assembly.

First Mixer Assembly Troubleshooting. When a malfunction has been isolated to the input mixer, see the simplified schematic, Figure 8-10, to confirm mixer failure. Check diode bias on internal mixing bands. Voltages should be in the range of −1V to −10V. The exact bias voltage is factory determined for each First Mixer Assembly and FREQUENCY BAND GHz setting. The buffer transistor can be checked by comparing the collector and emitter currents. Disconnect the −10V lead at the emitter bias terminal and measure emitter current with a milliammeter such as the HP 412A. Connect −10V lead and repeat measurement procedure at the +10V terminal. The emitter current should be 18.5 mA ±20 percent. The collector current should be not more than 10 percent less than the emitter current. To check the mixer diode, turn instrument power off, disconnect DIODE BIAS lead, and check front to back ratio of diode circuit. Set HP 412A to 1KΩ position, connect red (positive) lead to DIODE BIAS pin and black (negative) lead to EMITTER BIAS pin. Reading should be greater than 10 megohms. Less than 10 megohms indicates a shorted diode. Reverse leads; reading should be between 1KΩ and 10KΩ. (Infinity indicates open diode.)

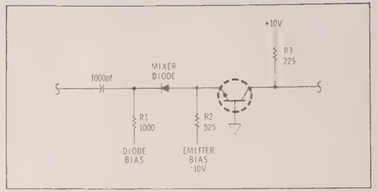


Figure 8-10. A30 First Mixer Assembly, Simplified Schematic

A31 YIG-Tuned Oscillator Assembly (M)

The YTO Assembly is used as the first LO in the analyzer. It is a sealed microcircuit which is not field repairable. It is a transistor oscillator with an yttrium-iron-garnet (YIG) sphere as the resonator. The resonant frequency of the YIG sphere is proportional to the applied magnetic field, which is proportional to the current in two coils (referred to in this manual as the Main Coil and the Tickler Coil). The coarse TUNING control determines the dc current in the Main Coil and tunes the oscillator from 2.0 to 4.46 GHz. The FINE tuning control determines the dc current in the Tickler Coil and tunes the oscillator ±0.5 MHz. The sweep ramp is applied to the Main Coil for wide frequency spans (5 MHz/DIV to 500 MHz/DIV). For narrow frequency spans (1 kHz/DIV to 2 MHz/DIV), the sweep ramp is applied to the Tickler Coil. In the stabilized mode, for spans of 100 kHz/DIV or less, the YTO is locked to a harmonic of the approximately 1 MHz frequency of the Voltage Controlled Crystal Oscillator (VCXO). The ERROR signal from this lock loop is fed back to control the YTO frequency by means of the Tickler Coil.

Two pairs of wires are brought out from the Main Coil. The current (from the YIG Driver Assembly) for driving the Main Coil flows through one pair. The other pair goes to the YTO Main Coil Filter (in the YIG Driver Assembly) which filters out noise applied to the Main Coil for the narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) and ZERO SPAN. The YTO requires −10V and +20V, which are applied through a bias board on the YTO. This bias circuit contains resistors to set the proper bias levels and also zener diodes to protect the internal YTO circuit from overvoltage.

Coax Switch K3 (N)

Coax Switch K3 has either 2050 MHz IF or 321.4 MHz IF going through it. It switches the Second Converter Assembly input to either the First Mixer Assembly output for internal mixing (2050 MHz or 321.4 MHz) or to the external mixing path for the external mixer (2050 MHz). The control for this relay comes from the Relay Driver Assembly.

◀ A2 Front Panel Control Assembly
SERVICE SHEET 5

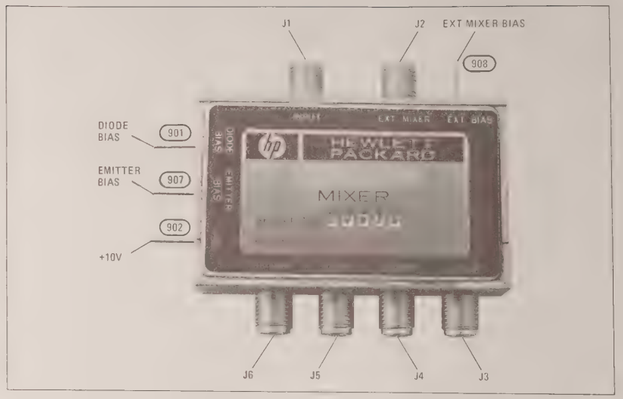


Figure 8-11. A30 First Mixer Assembly

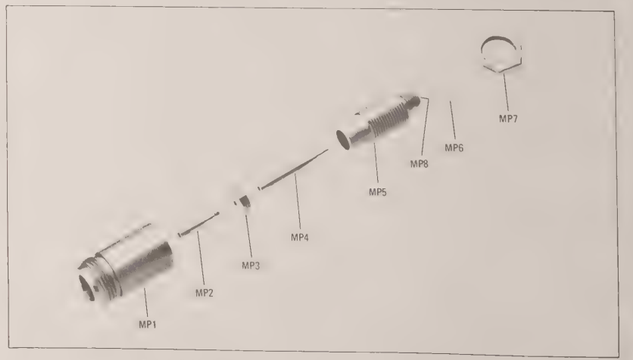
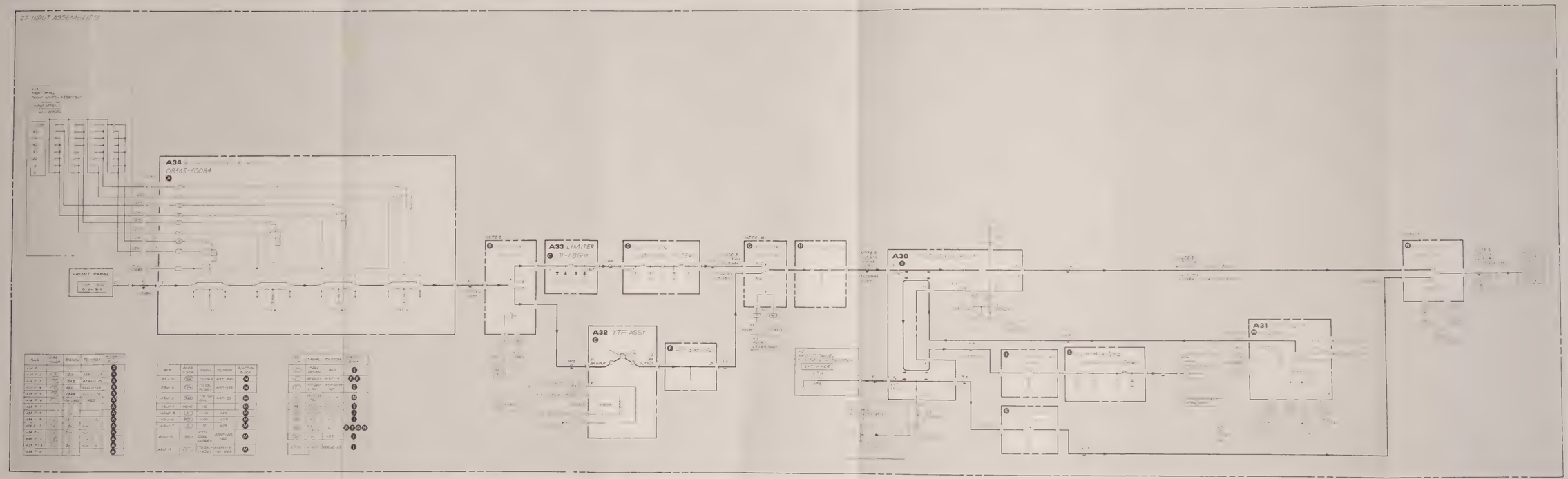


Figure 8-12. INPUT 50Ω Connector J11, Exploded View



6
A30, A31,
A32, A33, A34

Figure 8-13. A30 First Mixer Assembly, A31 YIG-Tuned Oscillator Assembly, A32 YIG-Tuned Filter Assembly, A33 Limiter, A34 RF Attenuator Assembly, Schematic Diagram

SERVICE SHEET 7
A35 SECOND CONVERTER ASSEMBLY, CIRCUIT DESCRIPTION

The Second Converter Assembly includes three subassemblies: A35A1 Second Converter Oscillator Housing Assembly, A35A1A1 Second Converter Oscillator Assembly, and A35A2 Second Converter Voltage Filter Assembly. The IF signal from the First Mixer Assembly is routed through the 2050 MHz Low Pass Filter and K5, K4 Coax Switches.

FL2 2050 MHz Low Pass Filter (A)

This filter is primarily used for the .01—1.8 GHz FREQUENCY BAND. It allows the 2050 MHz IF signal to pass but filters out higher frequency mixing products that are generated in the First Mixer Assembly.

K5, K4 Coax Switches (B) (G)

For the .01—1.8 GHz FREQUENCY BAND, these two switches route the 2050 MHz IF signal through the Second Converter Assembly where the signal is down-converted to 321.4 MHz. For the higher internal mixing FREQUENCY BANDS, K5 and K4 Coax Switches bypass the Second Converter Assembly. This bypass is provided in the higher FREQUENCY BANDS because the IF signal from the First Mixer Assembly is already at 321.4 MHz.

MP1 Cavity Block (D)

The IF signal from the First Mixer Assembly is coupled into the Second Converter bandpass filter through coupling loop A35L1. The bandpass filter consists of three circular, slug-tuned cavity resonators operating as less than quarter wavelength inductive transmission lines. The cavities provide high Q for good selectivity at 2050 MHz. Coupling loops A35L2 and A35L3 provide coupling between the cavities. The 2050 MHz signal is loop-coupled to the cathode of the second mixer diode A35A1CR1.

A35A1A1 Second Converter Oscillator Assembly (F)

The second local oscillator is a Colpitts type circuit operating at 1728.6 MHz. The capacitive "fingers" etched on the A35A1A1 Second Converter Oscillator Assembly printed circuit board and the internal capacitances of A35A1A1Q1 provide the positive feedback necessary to sustain oscillation of the second LO. The oscillator tank circuit is a slug-tuned cavity, A35C4. The signal from the second LO is coupled into the cavity by a 4-40 machine screw extending down into the cavity. The second LO output is also available at test jack A35A1J3.

A30 First Mixer Assembly
A31 YIG-Tuned Oscillator Assembly
A32 YIG-Tuned Filter Assembly
A33 Limiter, A34 RF Attenuator Assembly
◀ SERVICE SHEET 6

A35A1 Second Converter Oscillator Housing Assembly (E)

The 1728.6 MHz local oscillator provides drive for A35A1CR1. The difference frequency between the first IF 2050 MHz, and the second LO frequency, 1728.6 MHz, is 321.4 MHz. This 321.4 MHz signal is coupled through the matching filter to the Third Converter Assembly.

The matching filter is a passive network designed to match the relatively high impedance (about 200 ohms) of the second mixer to the low input impedance (about 50 ohms) of the Third Converter Assembly. The match may be optimized by adjusting A35A1L2, 2ND MIXER MATCH.

A35A2 Second Converter Voltage Filter Assembly (C)

The Second Converter Voltage Filter supplies the dc bias to the Second Converter Oscillator Assembly. The +20V is filtered by A35A2R1 and A35A2C1 and is reduced to about +15V by the drop across A35A2R1. The negative bias voltage (−10V) is filtered through A35A2R2 and A35A2C2. The voltage at the oscillator is approximately −5V.

A35A2Q1 functions as a switch to turn the oscillator on or off. When the dc control line SW is at ground, A35A2VR1 is back-biased and the transistor is turned on through A35A2R3. To turn off the transistor, SW goes to approximately +26V, which breaks down A35A2VR1 and back-biases A35A2CR1, turning A35A2Q1 off.

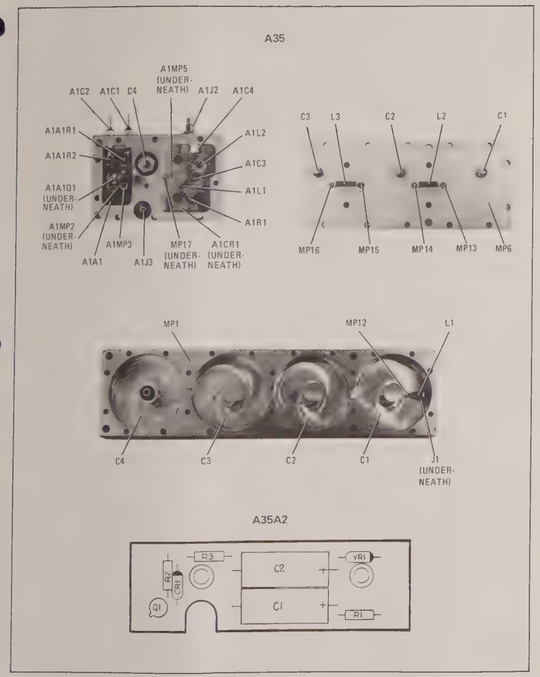


Figure 8-14. A35 Second Converter Assembly, Component Locations

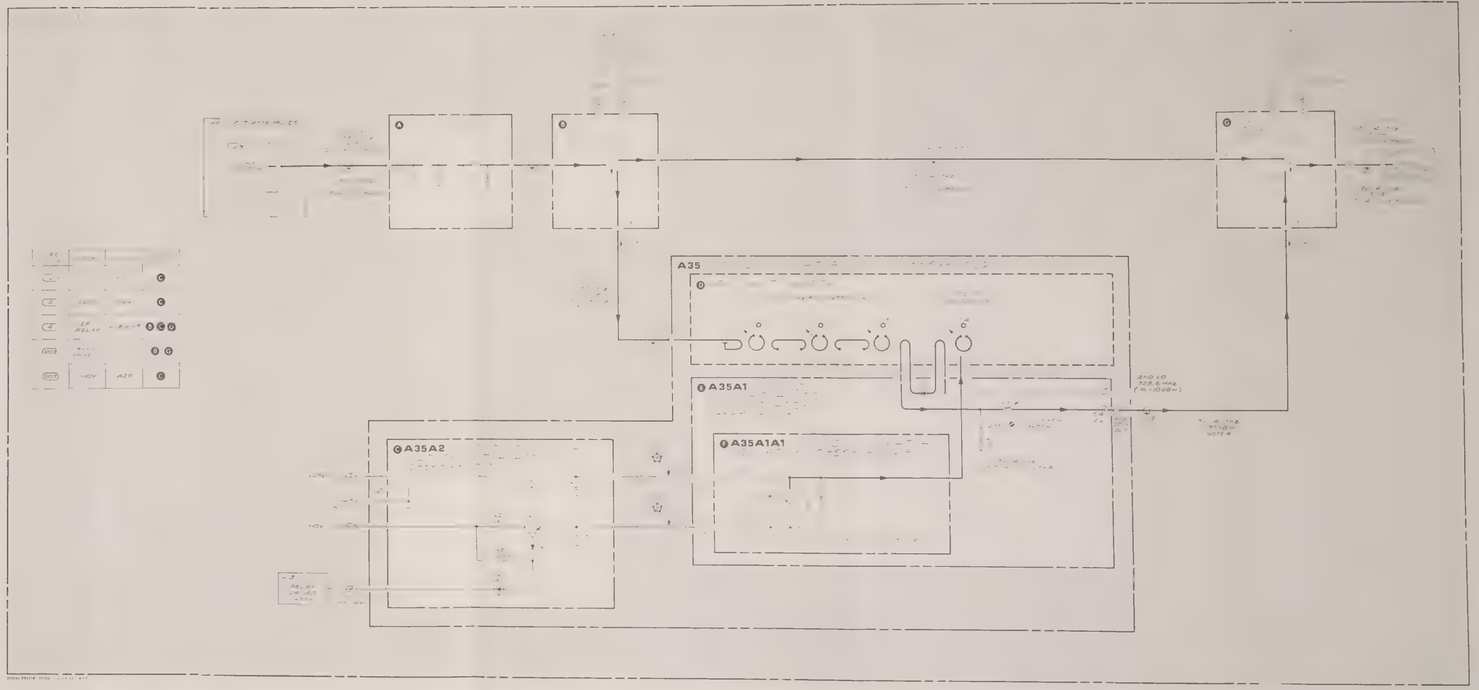


Figure 8-15. A35 Second Converter Assembly, Schematic Diagram

SERVICE SHEET 8
A37 THIRD CONVERTER ASSEMBLY, CIRCUIT DESCRIPTION

The Third Converter Assembly contains circuitry to amplify and down-convert to 21.4 MHz the 321.4 MHz signal from coax switch K4. The conversion gain in the Third Converter Assembly is approximately 11 dB. The Third Converter Assembly also contains circuitry to provide the −10 dBm, 100 MHz CAL OUTPUT signal at the front panel and circuitry for signal identification. Figure 8-16 shows a simplified block diagram of this assembly.

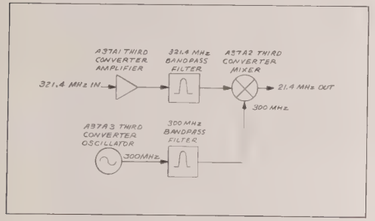


Figure 8-16. Third Converter Assembly, Block Diagram

A37A1 Third Converter Amplifier (A)

The Third Converter Amplifier provides a broad-band fixed gain of approximately 20 dB to the incoming 321.4 MHz IF signal. The amplifier is a single-stage, common-emitter transistor amplifier whose gain is determined by the high-frequency characteristics of A1Q1, input matching capacitor A1C1, and the output matching elements A1L1, A1R5, and A1C6. Also included is a 700 MHz low-pass filter consisting of two shunt transmission line capacitors and two series transmission line inductors. This low-pass filter attenuates the first LO feedthrough to prevent overloading of the amplifier when the first LO is tuned to approximately 2050 MHz and below.

Bias to the RF amplifier transistor A1Q1 is provided by A1Q2 and A1R1 through A1R4. Note that Q2 and associated components are decoupled from the RF signal by A1C4 and A1C5.

321.4 MHz Bandpass Filter (C)

The 321.4 MHz Bandpass Filter is used to limit the signal power applied to the Third Converter Mixer to a 3 dB bandwidth of about 7 MHz centered at 321.4 MHz. It uses four helical resonators which are tap-coupled at the input and output and slot-coupled to each other. The resonators are capacitively tuned by tuning slugs C1 through C4. J5 provides a test port for filter alignment.

A37A2 Third Converter Mixer (H)

The Third Mixer converts the IF signal from the 321.4 MHz Bandpass Filter to 21.4 MHz, using the signal from the 300 MHz Bandpass Filter as the local oscillator. The Third Converter Mixer is an unbalanced triply tuned mixer. The 321.4 MHz input signal is fed to mixer diodes A2CR1 and A2CR2. It is switched on and off to the 21.4 MHz output at a 300 MHz rate by the 300 MHz local oscillator signal. A2CR1 and A2CR2 are used in parallel to reduce resistance when the diodes are on. Output matching network A2L1 through A2L3 and A2C12 transforms the impedance seen at the cathodes of A2CR1 and A2CR2 to approximately 50Ω. It also provides an open circuit for the 321.4 MHz IF signal and 300 MHz local oscillator signal.

The mixer is triply tuned in the sense that power from any one of the three signals present in the mixer (321.4 MHz, 300 MHz, and 21.4 MHz) cannot be lost in a port that is used for the other two signals. For example 321.4 MHz power cannot be directly lost out the 21.4 MHz port, because L2 is essentially an open circuit at 321.4 MHz; nor can it be lost out the 300 MHz LO port, because the 300 MHz Bandpass Filter is reflective at 321.4 MHz.

A37A3 Third Converter Oscillator

The Third Converter Oscillator contains a 100 MHz Crystal Oscillator. This oscillator drives a Frequency Tripler, which amplifies and triples the 100 MHz signal to provide a high level 300 MHz signal to drive the Third Converter Mixer. It also contains a Limiter, which provides an amplitude-stable, temperature-compensated −10 dBm signal. This signal is filtered by the 150 MHz Low-pass Filter to remove harmonics produced in the Limiter. A Regulator provides dc bias voltages to the 100 MHz crystal oscillator and limiter.

100 MHz Crystal Oscillator (D) . The 100 MHz Crystal Oscillator is a grounded-base Colpitts oscillator which uses a series resonant, fifth overtone crystal in the collector to emitter feedback path to achieve frequency stability and low noise. A3Q2 provides unity current gain from the emitter to the collector. The current at the collector is transformed up by tank circuit A3L4, A3C12, and A3C13 and then fed back to the emitter through series resonant crystal A3Y1, A3Y2, or A3Y3 and associated PIN switching diode A3CR1, A3CR2, or A3CR3. The tank circuit A3L4, A3C12, and A3C13 is a frequency-selective transformer which also prevents the oscillator from oscillating at other overtones of the crystal. Output power is tapped out of the tank through A3C14 to resistive network A3R20, A3R21, A3R19, and A3R22, which distributes the output power and provides a constant load to the oscillator. The 100 MHz Crystal Oscillator is capable of oscillating at the series resonance of either of the three crystals A3Y1, A3Y2, or A3Y3. In normal operation, control line F3 is pulled down to approximately 0V, turning on PIN diode A3CR2 to provide an RF feedback path through A3Y2. Control lines F3− and F3+ are open, and pull-up resistors A3R13 and A3R15 back bias A3CR1 and A3CR3, keeping them off to open the RF feedback paths through A3Y1 and A3Y3. During Signal Identifier operation (available on 1 MHz/DIV span only), control line F3 is switched between 0V and +20V on alternate sweeps, with either F3− or F3+ (depending on which frequency band is selected) being switched to 0V when F3 is switched to +20V. This moves the frequency of the Crystal Oscillator from 100 MHz (F3 at 0V) to 99.33 Mhz (F3− at 0V) or 100.67 MHz (F3+ at 0V). Since the signal frequency from the Crystal Oscillator is multiplied by 3 in the Tripler before it is used as a local oscillator to drive the Third Converter Mixer, the local oscillator for the Third Converter Mixer is capable of being switched from 300 MHz (F3) to 298 MHz (F3−) or 302 MHz (F3+).

Bad crystals (or associated bias components) can be easily identified by unsoldering incoming control wires to F3−, F3, and F3+. If the oscillator will not oscillate with one of the control lines grounded but does oscillate with either of the other two grounded, then the crystal (or one of the associated bias components) is probably faulty. Try to restore oscillation by retuning A3L4 and then tapping or moving components in the tank circuit.

Tripler (E) . The Tripler contains a 100 MHz linear, common-emitter amplifier A3Q1 which provides approximately 20 dB of gain. A3Q1 drives a Class C common-emitter amplifier/tripler A3Q3. Matching elements A3C4, A3C5, and A3L2 tune the collector of A3Q1 and the base of A3Q3 to 100 MHz. The collector of A3Q3 is tuned to 300 MHz by A3L3 and the following 300 MHz Bandpass Filter.

Note that with no or low RF signal driving the Frequency Tripler, dc voltages at TPF and A3TP3 will be incorrect, since with no input signal, A3Q3 is off, with no dc collector and emitter current.

Limiter (F) . The Limiter is a two-stage amplifier using emitter-coupled transistor pairs for each amplifier stage. Each stage limits the incoming 100 MHz signal by overdriving the base of the input transistor to a point where the grounded base output transistor switches from zero collector current, when the base of the input transistor is driven positive, to the full bias current, when the base of the input transistor is driven negative. Schottky-Barrier diodes A3CR4 and A3CR5 further limit the output of the first stage to prevent overdriving the second stage. Both amplifier stages are biased with constant emitter current for each pair by current source transistors A3U1B and A3U1E. All six transistors A3U1A through A3U1E are contained in a 10-pin integrated circuit which helps improve performance by reducing stray capacitance and lead length inductance.

Proper overall operation of the limiter can be checked by monitoring both the front-panel CAL OUTPUT and the 100 MHz test output J4 while detuning A3L4 OSC PEAK in the 100 MHz Crystal Oscillator. As A3L4 is detuned, the power at the 100 MHz test port J3 will decrease. If the Limiter is operating properly, the front-panel CAL OUTPUT level should change less than 0.1 dB for a 10 dB change in the 100 MHz test output.

150 MHz Low-pass Filter (I) . The 150 MHz Low-pass Filter attenuates the harmonics present at the output of the Limiter. This filter is based on a five-element, 0.01 dB ripple, Chebyshev design with a 3 dB cutoff frequency of 150 MHz. If the Limiter and the 150 MHz Low-Pass Filter are operating properly, the second and higher 100 MHz harmonics will be attenuated by greater than 30 dB.

Regulator (B) . The Regulator is a resistive divider and emitter follower used to furnish dc bias voltages to the 100 MHz Oscillator and to the Limiter.

300 MHz Bandpass Filter (G) . The 300 MHz Bandpass Filter is used to reject all 100 MHz harmonics but the third produced in the Frequency Tripler. Its operation is the same as for the 321.4 MHz Bandpass Filter.

A37 THIRD CONVERTER ASSEMBLY TROUBLESHOOTING

Proper operation of the Third Converter Assembly can usually be verified by checking the conversion gain from 321.4 MHz to 21.4 MHz as called out by signal levels on the schematic. If the conversion gain is low but the 100 MHz signals at the front panel CAL OUTPUT and 100 MHz test port J3 are correct, the internal signal levels in the Third Converter Assembly should be measured. To do this, the helical resonators must remain covered or they will be mistuned. This can be accomplished by first removing the Third Converter Assembly cover. The Third Converter Assembly is then tilted out from the instrument. The cover is then turned upside down (side with silkscreen markings against the housing) and one side of it used to cover the helical resonators. Use the mesh gasket between the cover and housing and place a piece of tape over A3Q4 and A3U1 to keep the gasket from possibly shorting these parts. Replace the 14 screws holding the cover and gasket in place over the helical resonators. When this is complete, the inputs and outputs of the helical resonators, the Third Converter Amplifier, the Third Converter Mixer, the Tripler, and the 100 MHz Crystal Oscillator will all be exposed. The helical resonators will not require readjustment.

The RF signal levels inside the Third Converter Assembly can now be checked with another spectrum analyzer and a 500Ω 10:1 resistive divider probe such as the 10020A. If such a probe is not available, a satisfactory substitute can be made from a BNC female connector and a 464-ohm, 1/8-watt resistor (see Figure 8-16). The spectrum analyzer should be used with the input attenuator set to 10 dB or greater for input protection and to provide a good 50-ohm load for the divider.

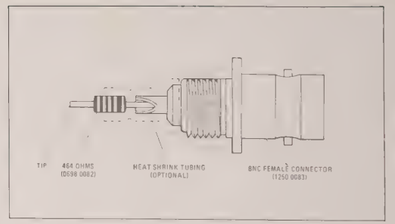


Figure 8-17. Substitute Divider Probe

The signal levels called out in the schematic can be traced with the probe and should read within ±2 dB of indicated levels. Care must be taken to identify the proper signal frequencies on the spectrum analyzer display. Signal level readings at TPA, TPB, TPC, TPF, TPH, J1, and J2 must be taken with the case of the probe grounded directly to a convenient point on the Third Converter Assembly housing or cover. Measurements at other test points can be made with the probe case ungrounded.

Note that a 321.4 MHz, −30 dBm signal from an external signal source can be applied to J1 in place of the internal signal from K5J1. This may be necessary if the signal peak cannot be found when tuning the 8565A.

If the conversion gain is low and the 100 MHz signal at test port J3 is low or nonexistent, or the front-panel CAL OUTPUT signal is low or nonexistent, then the Third Converter Oscillator should be troubleshot. This can be done by removing the cover and leaving the Third Converter Assembly housing in place. Note that the helical resonators will be uncovered and therefore mistuned, so RF signal levels at TPA, TPB, TPC, TPF, TPH, and J2 will be incorrect. However, removal of the cover will allow access to the components of the Limiter.

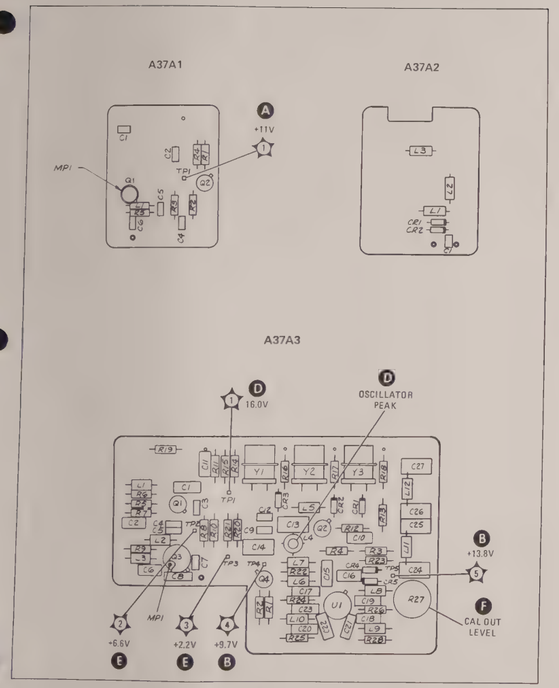


Figure 8-18. A37 Third converter Assembly, Component Locations

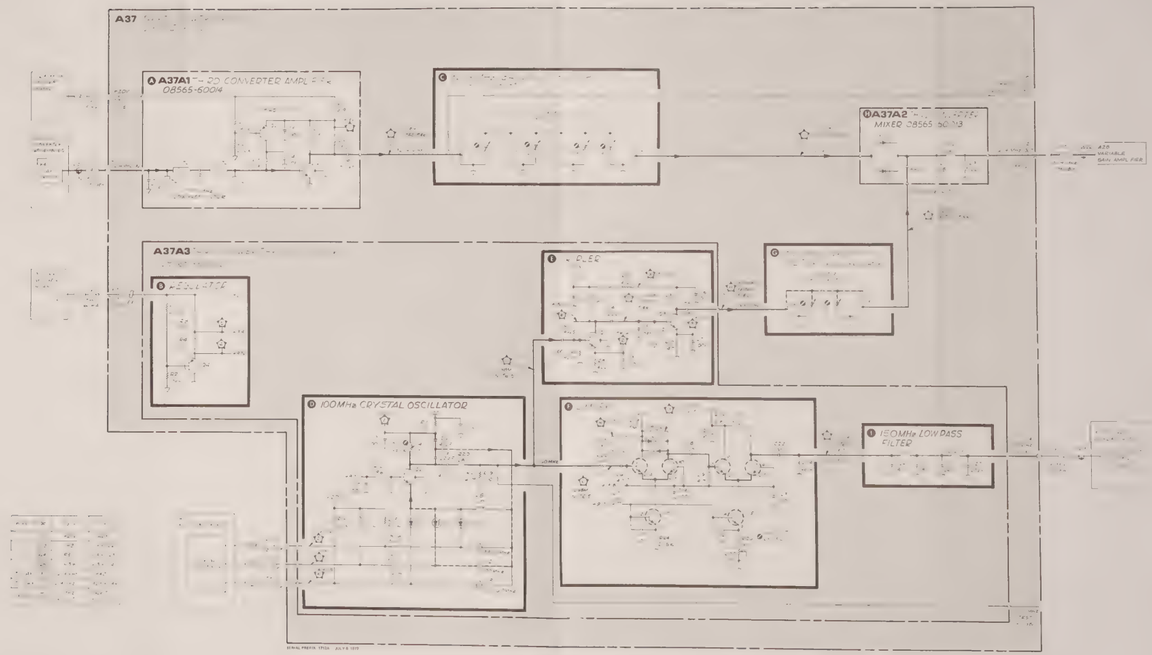


Figure 8-19. A37 Third Converter Assembly, Schematic Diagram

SERVICE SHEET 9
A13 RELAY DRIVER ASSEMBLY, CIRCUIT DESCRIPTION

The Relay Driver Assembly receives input from the SIG IDENT and FREQUENCY BAND GHz switches on the front panel. A RETRACE BLANK signal from the Sweep Generator Assembly is used during the signal identification. The Relay Driver controls Coax Switches K1 through K5 and provides a means to identify a displayed signal (except in FREQUENCY BAND GHz setting 0.1–1.8) by controlling the frequency of the local oscillator in the Third Converter Assembly.

Signal Identifier (A)

The Signal Identifier shifts the displayed signal 2 divisions to the left on alternate sweeps (except for the 100 MHz CAL signal) when the front-panel SIG IDENT button is pressed and FREQUENCY SPAN/DIV is set to 1 MHz. The flip-flop U1 is enabled by a high preset signal at pin 4 and is toggled on alternate sweeps by the RETRACE BLANK input. The output of U1 selects a crystal offset in the Third Converter Assembly. The crystal for the correct offset is selected by the frequency band inputs B5, B6, and B7. The F3+ line is enabled and is switched in when B5, B6, or B7 turns on Q6 and U1 toggles. A low at Q6 collector pulls the base of Q1 down, disabling the U1 input to Q1. At the same time, Q6 low drives Q5 high, enabling the U1 input to Q2, which in turn drives the F3+ line.

When B5, B6, or B7 is not selected, Q6 collector is high, enabling Q1 and shorting Q2 base to ground through Q5. Q6 then drives the F3– line.

When the Signal Identifier is not enabled by the front-panel switches, the Q output of U1 (pin 5) is driven high by a low at the preset input. This high output turns on Q4, driving the F3 line low.

Relay Driver (B)

The Relay Driver accepts signals from the front-panel FREQUENCY BAND GHz pushbuttons and activates the EXT MIXER RELAY, the IF RELAY or the RF RELAY lines. When B1 is selected, both Q9 and Q10 are turned on, activating the IF RELAY and RF RELAY Lines, which energize coax switches K1, K2, K4, K5 and the Second Converter. When either B7 or B8 is selected, Q8 and Q9 are turned on, activating both the EXT MIXER RELAY and the IF RELAY lines, which energize coax switches K1, K2, and K3.

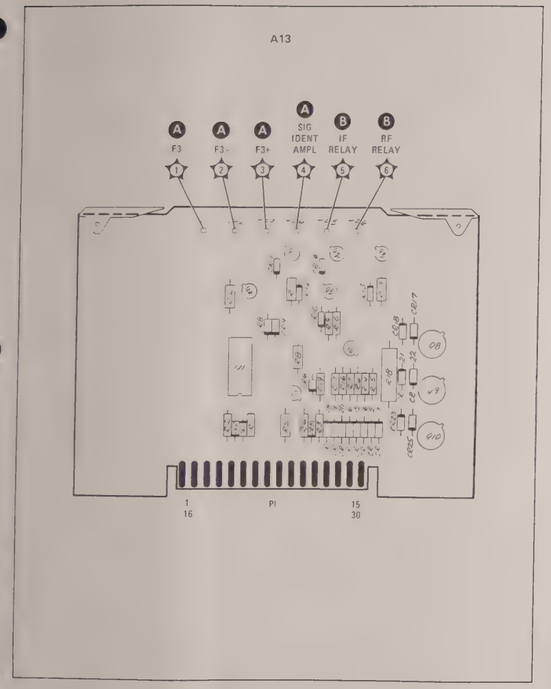


Figure 8-20. A13 Relay Driver Assembly, Component Locations

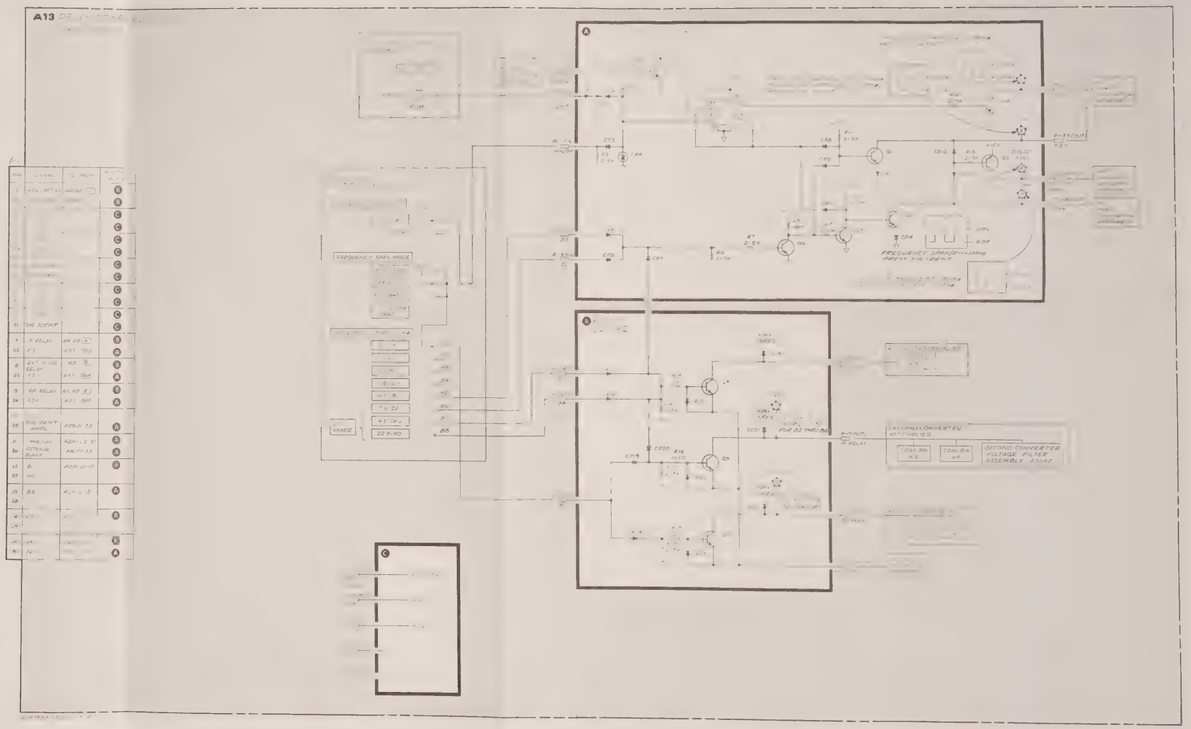


Figure 8-21. A13 Relay Driver Assembly, Schematic Diagram

SERVICE SHEET 10
A16 SWEEP GENERATOR ASSEMBLY, CIRCUIT DESCRIPTION

The Sweep Generator Assembly contains circuits which trigger and generate a −5V to +5V linear ramp that horizontally sweeps the CRT display. The sweep voltage is also processed in the Sweep Attenuator and Full Multiband Assemblies to sweep the analyzer frequency. The Sweep Generator circuit supplies the RETRACE BLANK signal to the Z Axis Amplifier Assembly and drives the front panel SWEEP indicator LED.

Calibrated SWEEP TIME/DIV can be varied from 2 μSEC/DIV to 10 SEC/DIV in a 1, 2, 5 sequence. In AUTO mode, sweep time is optimized for particular RESOLUTION BW, FREQUENCY SPAN/DIV, and VIDEO FILTER settings.

A current source in the Sweep Generator Assembly charges a timing capacitor with a constant current to generate the linear ramp voltage which is applied to a buffer amplifier, providing the low impedance INT SWP output.

A sweep comparator controls the sweep start and stop voltages and discharges the timing capacitor at the end of the sweep. Manual sweep circuitry in the sweep generator controls the dc output voltage of the INT SWP signal according to the position of the MANUAL SWEEP control on the front panel.

In frequency spans greater than 50 MHz/DIV in AUTO mode, a current-limiting circuit in the Sweep Generator Assembly prevents the analyzer from sweeping frequency faster than approximately 20 MHz per msec. Logic circuitry in the Sweep Generator Assembly determines which of six different values of current limiting to apply to the Sweep Generator Current Source, depending on analyzer frequency span.

In VIDEO, EXT, and LINE settings of SWEEP TRIGGER, a trigger comparator in the Sweep Generator Assembly starts a sweep when the trigger signal exceeds the trigger level.

The External Sweep Input Buffer circuit converts a 0V to +10V SWEEP SIGNAL applied to the rear-panel EXT SWEEP INPUT to a −5V to +5V SWEEP voltage which goes to the front-panel SWEEP SOURCE switch. The 1/N Sweep Attenuator provides to the Sweep Attenuator Assembly a sweep signal of −5V to +5V divided by the harmonic mixing number of the selected frequency band (see schematic Note 6).

Current Source (A)

Current for the generation of the sweep is provided by a Current Source as shown in the simplified circuit in Figure 8-22. In the Temperature Dependent Power Supply, U2A provides a nominal +10V; diode Q4 is the temperature sensing element.

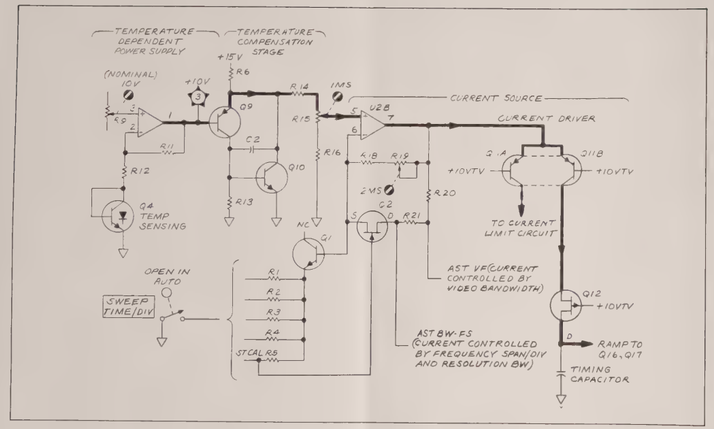


Figure 8-22. Simplified Circuit for Sweep Generator Current Source

Because of the rise times for specific RESOLUTION BW and VIDEO FILTER settings, an error is caused in the displayed signal amplitude and frequency if the spectrum analyzer is swept too fast. In the AUTO mode, the sweep time is controlled by the RESOLUTION BW, FREQUENCY SPAN/DIV, and VIDEO FILTER settings, which control the current to the inverting (−) input of U2B. This current in turn controls Current Source current. Current to U2B is set by resistors on the AST BW-FS line that are connected by transistor switches to ground in various combinations, depending on RESOLUTION BW and FREQUENCY SPAN/DIV settings. Resistors connected to the AST-VF line control current to U2B that depends on the front-panel VIDEO FILTER setting. Resistors and transistor switches on the AST BW-FS and AST VF lines are located in the Video, Sweep Attenuator, and Full Multiband Assemblies. The resistors are sized so that AUTO sweep time is proportional to frequency span width and inversely proportional to the square of the resolution bandwidth (or video bandwidth, if video filtering is used).

In either calibrated or AUTO sweep time, the currents set at the inverting (−) input of U2B are summed to produce a voltage at the output of U2B (Pin 7) proportional to the log of the sweep rate. Q11, the equal current driver, converts voltage variations into current variations proportional to the sweep rate. Q11B applies current through Q12 to timing capacitors C12 and C13 in the Sweep Generator circuit. Q11A applies a current (proportional to Q11B collector current) to the Auto Sweep Time Current Limit circuit.

Q9 provides temperture compensation for Q11. Q10 is a constant current regulator for Q9.

In the calibrated SWEEP TIME/DIV mode, the gate of Q2 is grounded. This turns Q2 off and disconnects the currents dependent on RESOLUTION BW, FREQUENCY SPAN/DIV, and VIDEO FILTER. Calibrated sweep times are now controlled by the current to the inverting (−) input of U2B through resistors R1 through R5, which are grounded in various combinations by the front-panel SWEEP TIME/DIV switch. Q12 is normally kept on by R22 to the +10VTV supply and buffers Q11B from C12 and C13. In 1.7 − 22 GHz SPAN mode, the STOP SWP line from the Full Multiband Assembly pulls Q12 gate to +25V, turning Q12 off. This causes the sweep voltage to be held at a constant level as long as STOP SWP is high. STOP SWP signals occur at band crossings to prevent gaps from appearing on the display. The STOP SWP line is held high for approximately 15 ms at each band crossing.

Sweep Generator (D)

Referring to Figure 8-23, the operation for generating a ramp voltage in AUTO sweep is as follows. The ramp begins when the dead-time capacitor C15 charges to about +1.2V through R81. This turns Q13 on, and U3 pin 2 is driven negative. The output of sweep comparator op amp U3 rises to approximately +14V, Q13 is held on by CR5, and reset-diode CR3 is back-biased. With CR3 off, the constant current source begins charging timing capacitor C13 positive. The Q13 collector remains low throughout the sweep. As C13 charges, the voltage at inverting (−) input of U3 increases until it reaches +2.71V. At this time, the voltage at the output of U3 begins to decrease. When the output of U3 decreases to approximately +12V, VR1 and CR5 stop conducting, turning off Q13. As Q13 turns off, the voltage at (inverting (−) input of U3 increases, causing output of U3 to go negative, discharging C13 through CR3. The change in U3 output of about −15V is coupled to the anode of CR7. With CR7 back biased, Q13 remains off. U3 continues to discharge until the voltage at the inverting (−) input set by the voltage divider R59, R65, and R66, reaches +2.71V. At this point (the beginning of the sweep dead time) the ramp is at −5V. The ramp remains at −5V until the dead-time capacitor C15 charges through R81 to +1.2V, turning on Q13 and repeating the sweep cycle.

Other components in the Sweep Generator have the following functions. C7 is a speed-up capacitor for U3 switching. C9 is a speed-up capacitor for Q13 turn-off at the end of the sweep. CR6, R69, and R70 prevent C9 from affecting Q13 except at the end of the sweep.

C8 and R62 desensitize U3 from spikes on the −15V supply. C4, C5 and R64 provide frequency compensation for U1 and C6 feedback compensation. CR4, and R67 are used to bring U3 out of saturation at the end of the ramp to improve switching speed.

Single Sweep Control. Q13 is initially held off by R83 and CR10. Q14 is on (TPA at approximately +9V), and voltage divider R72 and R73 charges C17 to +2.8V. When the SWEEP TRIGGER switch is in SINGLE position, and the momentary START/RESET pushbutton is pressed, +15V is applied to R78, turning on Q8. This shorts the positive end of C17 to ground and produces a negative pulse at the emitter of Q13. This turns Q13 on, starting a sweep.

During the generation of a sweep, Q14 emitter is at −0.6V, and the voltage divider R72 and R73 charges C17 to −4V. The sweep may be aborted (reset to −5V) by pressing the START/RESET pushbutton. This turns on Q8. The negative end of C17 is shorted to ground, a positive pulse is generated at the emitter of Q13, and Q13 is turned off, aborting the sweep. The START/RESET pushbutton will abort any sweep regardless of the SWEEP TRIGGER setting.

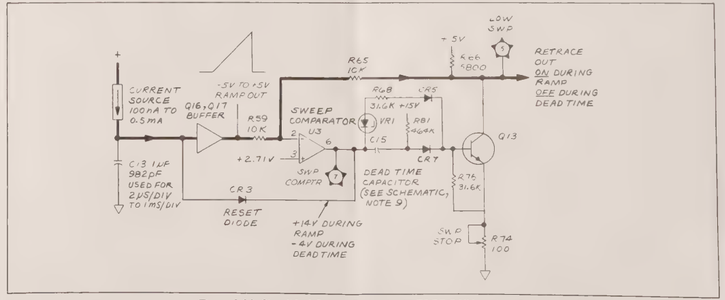


Figure 8-23. Simplified Sweep Generator in FREE RUN or AUTO

Fast/Slow Sweep Time Operation. Timing capacitors C12 and C13 are used to provide fast and slow sweep operation. When a fast sweep time (≤1 mSEC/DIV) is selected by the SWEEP TIME/DIV switch, the ST FAST control line is grounded, turning off Q18 and Q15. With Q15 off, C12 and C13 are in series and C12 is the timing capacitor. With Q18 off, the +15V at R88 will back bias CR11 and CR9, so C15 is switched out of the dead time circuit. C11 is switched out of the dead time circuit by CR8, R84, and Q21 for all frequency span modes except FULL BAND and 1.7—22 GHz SPAN. The short dead time (about 0.4 ms) is set by C10. For sweep times >1 mSEC/DIV (or in AUTO sweep times), the ST FAST control line is open, and Q18 and Q15 are both on. With Q15 on, a ground is provided for C13, and it becomes the timing capacitor. If the same amount of charging current is supplied to a larger capacitor, it will charge at a slower rate. CR11 and CR9 are on because of the conduction of Q18. C10 and C15 are in parallel, so the longer dead time (about 22 ms) is set by C15.

In FULL BAND or 1.7—22 GHz SPAN modes, Q21 is turned on by CR25 (FULL BAND) or CR26 (1.7—22 GHz SPAN). This forward biases CR8, placing C11 in parallel with C10 and C15. This sets the dead time at about 80 ms.

FREE RUN Operation. In FREE RUN mode, +15V is applied through the SWEEP TRIGGER switch to the voltage divider R82 and R83. The voltage at the cathode of CR10 is approximately +1.5V and CR10 does not conduct. The Sweep Generator circuit free runs and Q13 turns on following the previous sweep and after the dead time, which is determined by the RC time constants.

Manual Sweep Control (C)

Manual control of the sweep is obtained with the SWEEP SOURCE switch in MAN (see Figure 8-24). In INT, Q19 and Q20 are turned off because Q20 base is plled to ground through R97 and Q19 is held off by R99. In MAN Mode, Q19 and Q20 ae turned on through R100. Q19 turns Q13 on and keeps it on. U3 holds CR3 on, and the feedback loop to the timing capacitor is closed. Turning the MANUAL SWEEP control chages the input current through Q20 to inverting (−) input of U3. Since the output current through R65 is constant, any change in MANUAL SWEEP current must be compensated for by a change in the current through R59, thereby varying the ramp output voltage.

Sweep Trigger (E)

The Sweep Trigger circuit generates the signal that is applied to the Sweep Generator to start a sweep in VIDEO, EXT, or LINE trigger modes. The front-panel SWEEP TRIGGER switch selects between the video signal (VIDEO), the external trigger signal from the rear panel (EXT), and an ac voltage at the line frequency (LINE). The ac line voltage is attenuated to a 0V to 3V peak-to-peak signal, and the external trigger is attenuated and filtered on the RF-IF Motherboard before being routed to the front-

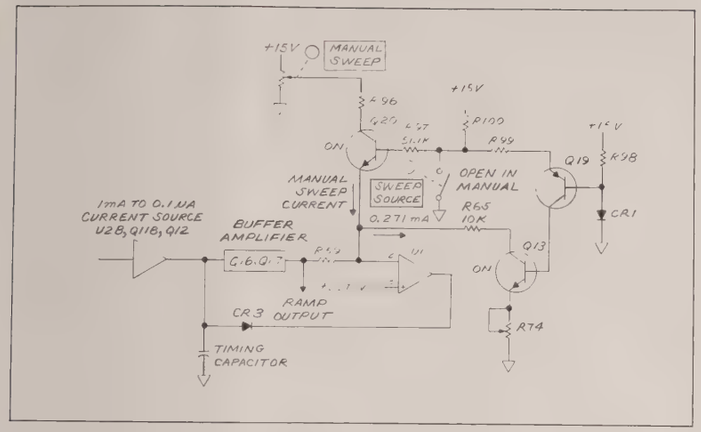


Figure 8-24. Manual Sweep Simplified Schematic

panel SWEEP TRIGGER switch. The selected trigger signal is applied to the inverting input of comparator U4. A 0V to 0.8V reference voltage proportional to the front panel TRIGGER LEVEL setting is applied to the noninverting input of U4 from voltage divider R121 and R122. When the SWEEP TRIGGER switch is in LINE, VIDEO, or EXT position, Q13 is held cut off by R83 and CR10. A sweep can then be generated only when a negative pulse is applied to the emitter of Q13 in the Sweep Generator. The negative pulse is generated by a Pulse Shaper circuit when the output of trigger comparator U4 goes low. The Pulse Shaper consists of a differentiator (C20 and R126) and an emitter follower (Q6).

During a sweep, RETRACE BLANK is approximately −0.6V, and Q3 and output pull-up resistor R124 disable U4 to prevent trigger pulses from going to the Sweep Generator. When RETRACE BLANK is high; and when trigger signal rises above the trigger level voltage, the output of U4 switches from approximately +5V to 0V, turning on Q6 through C20. A negative-going pulse is coupled through R75 to turn on Q13 in the Sweep Generator, starting a sweep.

After the ramp is completed, the circuit returns to its dead-time state, and another trigger is required to generate another sweep. Triggers (negative transitions at output of U4) may occur during the dead time, but these will not start a sweep until the end of the dead time, when the dead time capacitors are charged sufficiently to place the anode of CR7 at approximately −2V or higher.

Auto Sweep Time Current Limit (B)

Tracking between the YTO and YTF is degraded if the analyzer frequency is swept too fast. To limit the frequency sweep rate to approximately 20 MHz per msec and a maximum rate of 2 msec per division, CMOS logic gates U5 through U8 in the Auto Sweep Time Current Limit circuit select which of six different current limit values to apply to the Current Source. Since sweep rate is proportional to current, limiting the current prevents the sweep rate from exceeding a certain upper limit. Control lines from the front-panel FREQUENCY SPAN/DIV, FREQUENCY SPAN MODE, and FREQUENCY BAND GHz switches drive the current limit logic. Refer to the simplified schematic, Figure 8-25.

Q11B supplies current to charge timing capacitors C12 and C13 in the Sweep Generator. Q11A supplies a current (proportional to timing capacitor current) to sampling resistors R27 through R33 in the Auto Sweep Time Current Limit circuit. The voltage developed across the sampling resistors is proportional to sweep rate and is compared with a reference voltage by op amp U1. When the input voltage at inverting (−) input of U1 is less than the reference voltage at non-inverting (+) input, the current source is not current limited. The output of U1 is approximately +14 volts, CR30 is reverse biased, and the current source is not affected. If the Current Source current level becomes high enough to cause the voltage across the sampling resistors (that is, the voltage at inverting (−) input of U1) to equal the voltage at the non-inverting input of U1, the current limit is activiated. The output of U1 is approximately +10V or less, and CR30 is forward biased, closing the feedback loop around Q11A, U1, CR30, U2B, and associated circuitry. When the this feedback loop is closed, the voltage at the positive input of op amp U2B is pulled down by current through R26. This reduces the voltage developed by U2B at the emitters of Q11A and Q11B, reducing the current supplied by Q11A to sampling resistors R27 throug R33, and the current supplied by Q11B to the timing capacitors in the Sweep Generator. The collector currents are held at a level at which the sampling resistor voltage equals the reference voltage. AST LIMIT R25 sets the reference voltage. R25 is adjusted to compensate for the mismatch in collector currents for equal base-emitter voltages in Q11A and Q11B.

The reference voltage is nominally +1V, but to compensate for mismatch in Q11, it can range between +0.6V and +1.4V.

Because of the similar operation of each of the current limits, only one case will be described. In the example, the analyzer is in PER DIV, 200 kHz/DIV, RESOLUTION BW of 10 kHz, VIDEO FILTER OFF. NARROW AND FS ÷ 10 control lines are approximately +15V. CR27 and CR28 are forward biased. R54 and R55 form a voltage divider, causing the input to U5D pin 12 to be approximately +5V, a logic high. The output of U5D is approximately +5V, and Q31 is turned on, placing R32 in parallel with R33. The output of U7C is low, FULL is low, and ST CAL is high, so Q5, Q7, and Q28 through Q30 are off. As shown in the table, Note 8, on the schematic, when the sampling resistance is R32 in parallel with R33, the sweep rate cannot be faster than ≈2 mSEC/DIV in AUTO. With the above bandwidth and frequency span settings, the auto sweep time is approximately 45 ms (4.5 ms/DIV). Suppose the bandwidth is now increased to 100 kHz. This increase in bandwidth by a factor of 10 would cause the current source to increase current by a factor of 100 (if the current limit were not present), resulting in a sweep rate of 45 μsec/div. However, the Current Source current only increases to the level that causes the voltage across the sampling resistors to equal the reference voltage at inverting (−) input of U1. At this point CR30 becomes forward biased and prevents current from increasing beyond the level required to generate a 2 ms per division sweep. In other frequency span widths, different sweep rate limits are set when the current limit logic selects different values of sampling resistance. See the table on the schematic (Note 8) for the current limits for various frequency span settings.

In calibrated sweep times, ST CAL is grounded, pulling U8A pin 1 low. U8A pin 2 goes high and turns on Q28, placing R27 in the sampling reisitance. This sampling resistance is low enough to pre vent current limiting in any of the calibrated sweep times.

(Continued on next page.)

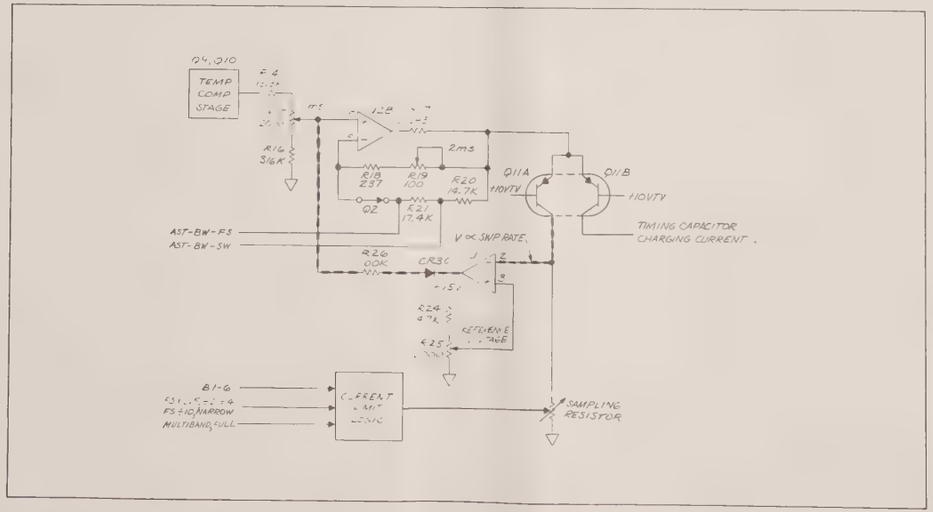


Figure 8-25. Auto Sweep Time Current Limit, Simplified Schematic

(Continued from preceding page.)

External Sweep Input Buffer (F)

When a 0V to +10V signal is applied to the EXT SWEEP INPUT on the rear panel, it is attenuated by resistive divider R127 and R128. The signal is amplified and level-shifted by U9A, R129, and R130. The output of op amp U9A is a −5V to +5V signal which becomes the analyzer sweep signal when the front panel SWEEP SOURCE switch is in the EXT position. VR3 protects U9A from excessive voltages applied to the input.

1/N Sweep Attenuator (G)

To maintain per division frequency span calibration in harmonic mixing modes, the sweep voltage supplied to the Sweep Attenuator Assembly is the −5V to +5V SWEEP divided by N. (N is the harmonic number.) In the .01 to 1.8 GHz frequency band, N = 1. Band control line B1 is +15V, and B2 through B8 are pulled to approximately −15V through pull-down resistors in theSweep Generator Assembly and the Frequency control Assembly. Q22 through Q27 of the 1/N Sweep Attenuator are turned off, and the sweep signal applied through R101 is not attenuated. The sweep is buffered by unity gain follower U9B. Operation is the same in the 1.7 to 4.1 GHz frequency band (N = 1). In the 3.8 to 8.5 GHz frequency band (N = 2), B3 is at +15V, turning on Q22. This causes R101 and R104 to form a 2 to 1 voltage divider, and 1/N SWP from U9B is now −2.5V to +2.5V. The operation of the 1/N Sweep Attenuator is similar for the remaining bands. Refer to the table on the schematic (Note 6) for the band line and harmonic number for each frequency band.

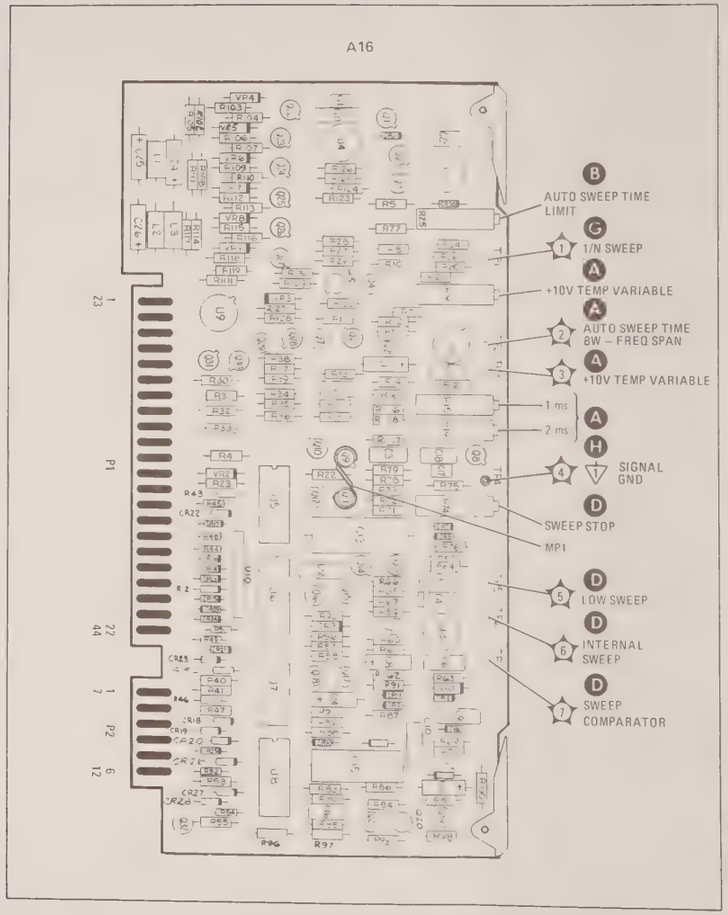
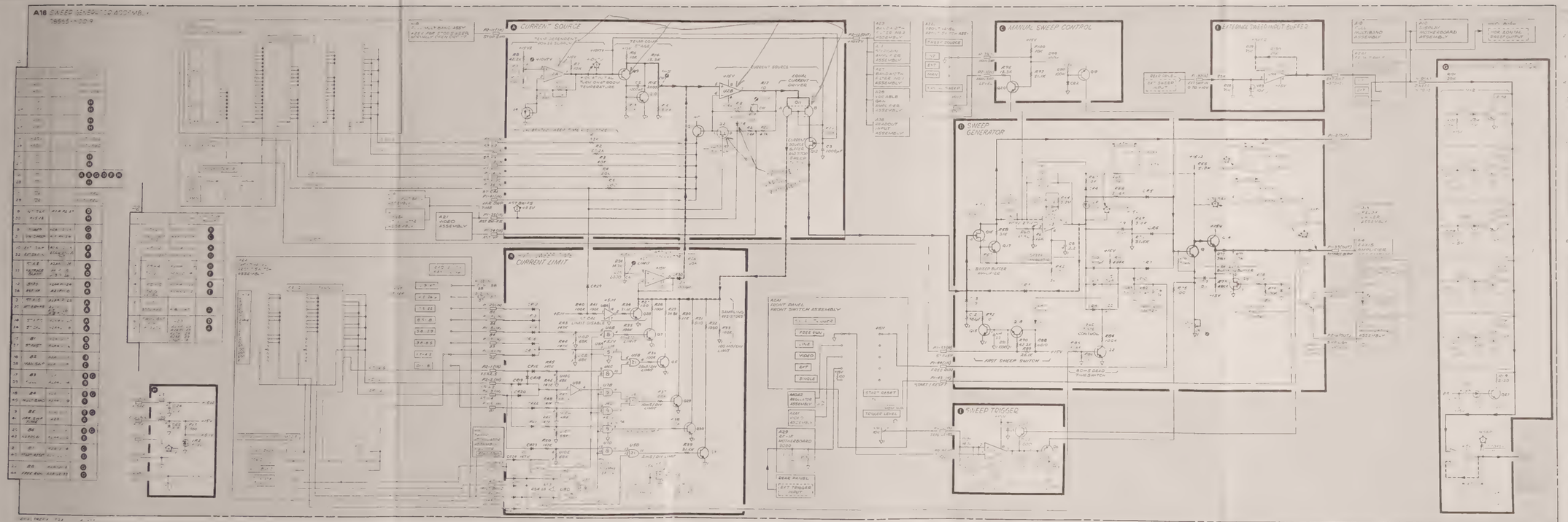


Figure 8-26. A16 Sweep Generator Assembly, Component Locations



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A16

Figure 8-27. A16 Sweep Generator Assembly, Schematic Diagram

SERVICE SHEET 11

A15 SWEEP ATTENUATOR ASSEMBLY, CIRCUIT DESCRIPTION

The Sweep Attenuator Assembly contains the circuits which attenuate the sweep ramp, 1/N SWP, from the Sweep Generator Assembly to provide the different frequency spans as selected by the FREQUENCY SPAN/DIV control. For wide frequency spans (5 MHz/DIV to 500 MHz/DIV) the 1/N SWP signal is attenuated and applied to the Frequency Control Assembly, where it is summed with the voltage from the TUNING control. The signal then goes to the YIG Driver Assembly, which applies current to the Main Tuning Coil of the YIG-Tuned Oscillator (YTO) to control its frequency. For narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) the 1/N SWP signal is attenuated and applied to the Tuning Stabilizer Control Assembly, where it is summed with the voltage from the FINE Tuning control. The output signal then goes to the Tickler Coil Driver, which applies current to the YTO tickler coil for small frequency changes.

DC control lines from the FREQUENCY SPAN/DIV switch at the front panel control transistor switches in the Sweep Attenuator Assembly to select the different sweep attenuation settings. The chart (schematic Note 7) gives the control lines which are activated (+15V) and the total attenuation factor of this assembly for each FREQUENCY SPAN/DIV setting. When one of the control lines is not activated, the front panel switch provides an open circuit for that line. If the only circuit involved was in this assembly, these lines would go to −15V because of the pull-down resistors. However, the lines also control circuits in the Readout Input Assembly, which pull a slight amount of current through these pull-down resistors. Thus, the voltage on these control lines, when they are not activated, is −14V. The FULL line is pulled down to −39V when it is not activated.

The capacitors across the inputs of U1, U3, and U4 reduce the susceptibility of these op amps to external RF interference.

With the SWEEP TIME/DIV control set to AUTO, the sweep time is automatically controlled by the Auto Sweep Time (AST) circuitry. The sweep time is varied as a function of RESOLUTION BW, FREQUENCY SPAN/DIV, and VIDEO FILTER settings to maintain absolute amplitude calibration. As the FREQUENCY SPAN/DIV switch position is changed, the control lines turn on AST transistors which connect AST resistors to ground through diodes. This controls the current in the AST BW-FS line to which all the AST resistors in this assembly are connected. The resistors in turn control the sweep time of the sweep ramp generated in the Sweep Generator Assembly. As the FREQUENCY SPAN/DIV is narrowed, with RESOLUTION BW and VIDEO FILTER held constant, the resistance on the AST BW-FS line is lowered, causing the sweep rate to increase. However, the sweep rate is limited to a maximum of 20 MHz/ms and 2 ms/div for AUTO sweep time by the Current Limit circuit in the Sweep Generator Assembly.

÷1, ÷2, ÷4, Zero Sweep Attenuator (A)

The 1/N SWP input comes from the Sweep Generator Assembly. It has a level of −5V to +5V for fundamental (N = 1) mixing mode operation. To maintain per-division frequency span calibration on harmonic mixing bands, this sweep input is reduced by the factor 1/N in the Sweep Generator Assembly (see schematic Note 6). This stage has a resistive voltage divider in which resistors are connected one at a time to ground by transistor switches. Op amp U5 is a non-inverting unity gain buffer.

When none of the control lines is activated, this stage has unity gain. When the FS ÷2 line is activated (+15V), Q22 and Q18 are turned on, connecting R5 to ground and producing a ÷2 voltage divider of R1 and R5. Q22 connects the ÷2 AST resistor R4 to ground through the base-emitter diode of Q18. When the ÷4 line is activated (+15V), Q23 and Q19 are turned on, connecting R9 to ground, and producing a ÷4 voltage divider of R1 and R9. Q23 connects the ÷4 AST resistor R8 to ground through the base-emitter diode of Q19. When ZERO SPAN mode is selected, the ZERO line is activated (+15V), turning on Q24 and Q20 to shunt the positive input of U5 to ground. Because of the saturation resistance of Q20 there is actually a voltage division of only a few thousand. This by itself is not sufficient attenuation of the sweep to put the analyzer in ZERO SPAN mode, so the ZERO line also activates, through CR14 and CR17 respectively, the ÷100 attenuator and switches the sweep to the TICK ATTEN SWP line. Q24 connects the Zero AST resistor R12 to ground through the base-emitter diode of Q20. The Tuning Stabilizer Control Assembly momentarily activates the ZERO line during the YTO frequency stabilization process.

Per Div Auto Sweep Time Switch (B)

The Per Div AST resistor R16 is connected to ground through Q27 and CR3 when the spectrum analyzer is neither in FULL BAND nor in PER DIV F mode. The FULL line is activated (+15V) for FULL BAND and PER DIV F modes. This turns on the inverter Q26, which turns off Q27. Thus R16 is disconnected, slowing down the auto sweep. The signal through CR2 turns off Q25, disconnecting the ÷1 AST resistor R36 when the FULL line is activated.

÷1, ÷10, X2.5 Sweep Attenuator (C)

This stage has op amp U2 connected as an inverting amplifier in which different sets of input and feedback resistors are selected by FET switches. Since the three sections (÷1, ÷10, and X2.5), which are switched in one at a time, are nearly identical, only the operation of the ÷10 section will be described. When the FS ÷10 line is not activated (open circuit at the front panel), Q12 has approximately −14V at the base and −14.5V at the emitter. This is enough reverse bias at the gate of Q9 to keep it turned off. R27 is a pull-down resistor which provides −15V for the FS ÷10 line.

When the FS ÷10 line is activated (+15V), Q12 is turned on with the base at approximately +0.6V and the emitter at 0V, connecting the gate of Q9 to ground. Now Q9 is no longer reverse biased by R25, but is turned on because the source and gate are at the same potential. (The source is at a virtual ground because of the operation of U2.) With Q9 on, the input resistor R22 and feedback resistor R23 are connected to the negative input of U2, giving an inverted attenuation of 10. When the FS ÷10 line is activated (+15V), Q21 is also turned on connecting the ÷10 AST resistor R38 to ground through CR10.

With Q9 on, CR5 has no effect; but when Q9 and this section are off, CR5 clamps the drain voltage of Q9 at −0.6V. This prevents Q9 from being turned on during part of a span because of the signal from the output of U2 being applied through R23. R24 reduces the current flowing through CR5 to prevent overloading of the output of U2. The ÷1 and X2.5 sections have higher value feedback resistors and do not have this current limiting resistor.

When the FS X2.5 line is activated (+15V), the X2.5 section is switched in, giving an inverted gain of 2.5 through the stage. There is no X2.5 AST resistor as this is the base freqency span from which all Per Div AST resistors are referenced. When neither the FS ÷10 nor the FS X2.5 line is activated, Q27 is turned off (CR7, CR8, and Q17 perform a NOR function) and the ÷1 section is switched in, giving an inverted unity gain. For ÷1, Q25 is turned on, connecting the ÷1 AST resistor R36 to ground through CR9.

÷1, ÷100 Sweep Attenuator (D)

This stage has op amp U1 connected as an inverting amplifier in which different sets of input and feedback resistors are selected by FET switches. These two sections (÷1 and ÷100) are nearly identical to the sections of the ÷1, ÷10, X2.5 Sweep Attenuator stage. (See the description of the ÷10 section.) When the FS ÷100 line is activated (+15V), the ÷100 section is switched in, giving an inverted attenuation of 100. The FS ÷100 line, when activated, also turns on Q14, connecting the ÷100 AST resistor R52 to ground through CR15. When the FS ÷100 line is not activated, the inverter Q6 is turned off and the ÷1 section is switched in, giving an inverted unity gain. MAIN SWP OFFSET adjustment R53 is adjusted to compensate for the op amp's offset voltage so that the signal remains centered on the CRT when the FREQUENCY SPAN/DIV control is switched from 5 MHz/DIV to 2 MHz/DIV (i.e., when the sweep is switched from MAIN ATTEN SWP to TICK ATTEN SWP).

Main and Tickler Coil Switches (E)

This stage is essentially an SPDT switch, routing the attenuated sweep ramp to either the Frequency Control Assembly or the Tuning Stabilizer Control Assembly. For wide FREQUENCY SPAN/DIV (5 MHz/DIV to 500 MHz/DIV) the NARROW line is not activated (open circuit at the front panel), and Q16 is turned on, shunting the sweep to ground at the positive input of U4. Q15 and Q7 are now turned off, so they do not shunt the sweep to ground at the positive input of U3. The attenuated sweep (MAIN ATTEN SWP) from this unity gain buffer amplifier is applied to the Frequency Control Assembly, where it is summed with the voltage from the TUNING control. The output signal then goes to the YIG Driver Assembly, where the YTO Driver applies a current to the Main Coil of the YTO, tuning the YTO over its full range, in which the frequency is proportional to the current.

For narrow FREQUENCY SPAN/DIV (1 kHz/DIV to 2 MHz/DIV) and for ZERO SPAN mode, the NARROW line is activated (+15V), turning Q16 off so it does not shunt the sweep to ground at the non-inverting (+) input of op amp U4. The attenuated sweep (TICK ATTEN SWP) from this unity-gain buffer amplifier is applied to the Tuning Stabilizer Control Assembly where it is summed with the voltage from the FINE TUNING control. The output signal is then applied to the Tickler Coil Driver, which provides a current to the YTO Tickler Coil. This current tunes the YTO over a small frequency range in which the frequency is proportional to the current. The NARROW line, when activated, also turns on Q7 and Q15, shunting the sweep to ground at the non-inverting (+) input of op amp U3. One of the two transistors which shunt the sweep to ground (Q15) is operated in the inverted transistor mode to achieve sufficient attenuation and a low offset voltage. When the NARROW line is activated, Q5 is turned on, connecting the Narrow AST resistor R62 to ground through CR18.

A16 Sweep Generator Assembly
SERVICE SHEET 10

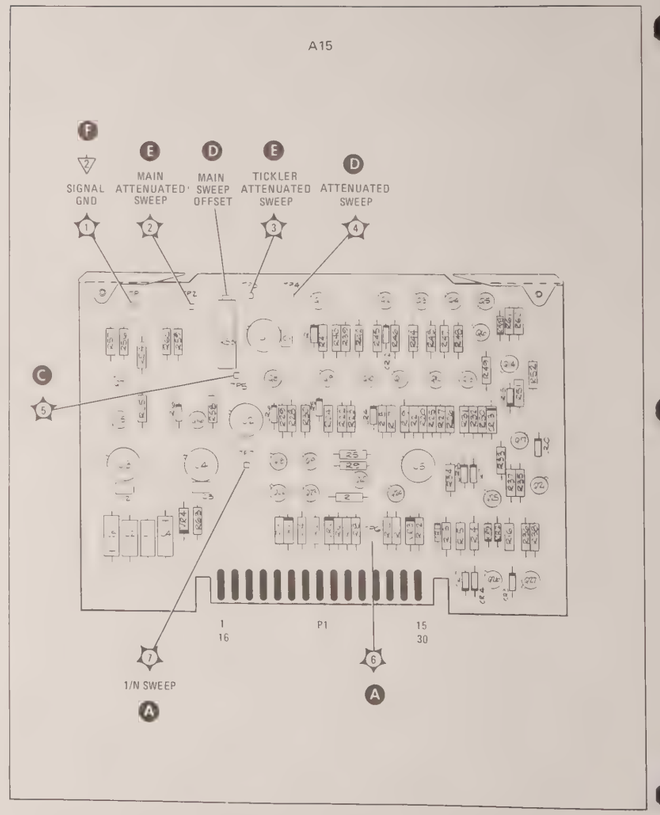

Figure 8-28. A15 Sweep Attenuator Assembly, Component Locations

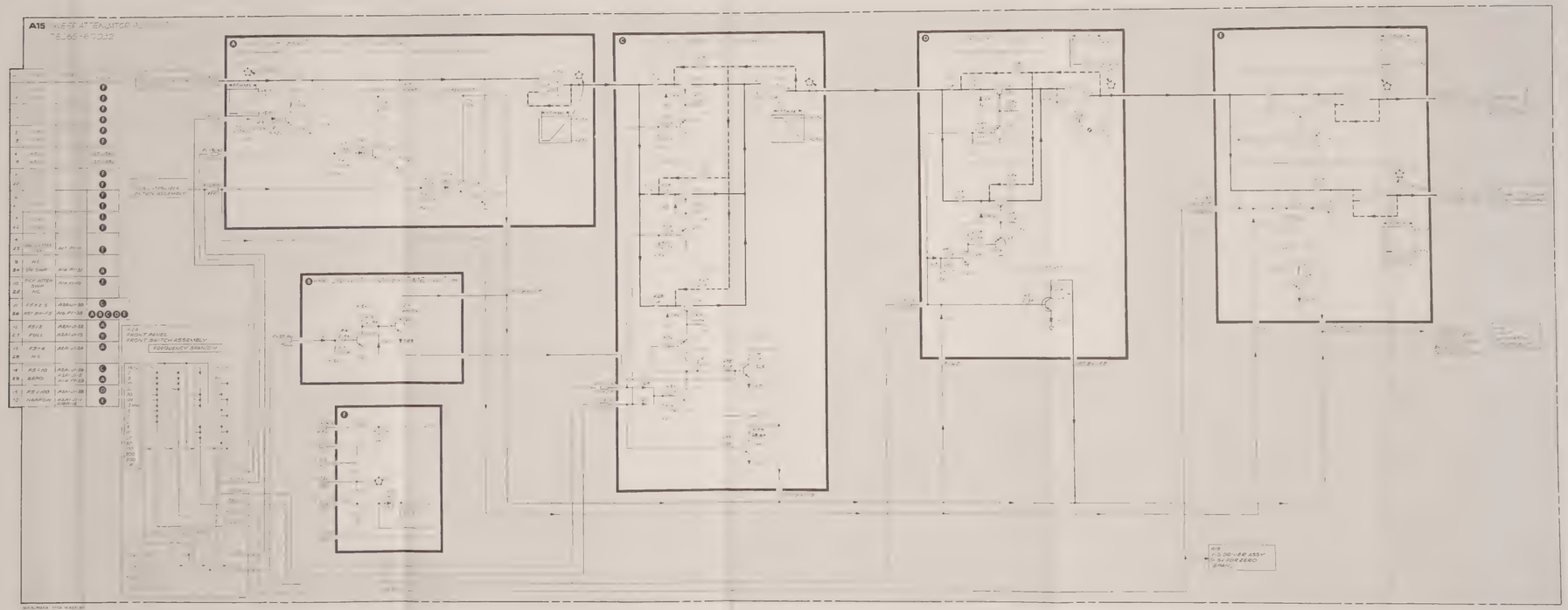

Figure 8-29. A15 Sweep Attenuator Assembly, Schematic Diagram

SERVICE SHEET 12
A17 FREQUENCY CONTROL ASSEMBLY, CIRCUIT DESCRIPTION

The Frequency Control Assembly contains circuits for controlling and displaying the frequency to which the analyzer is tuned. There are three main outputs from this assembly: a signal proportional to the YTO frequency, a signal proportional to the YTF frequency, and a signal proportional to the center (or marker) frequency. It also includes three precise, low-noise, reference power supplies. The TUNE voltage and offset voltages are derived from these. The outputs of the power supplies are also used in other assemblies in the analyzer.

The MAIN ATTEN SWP from the Sweep Attenuator Assembly is summed with the voltage from the coarse TUNING control in this assembly. The YTO FREQ ANALOG (proportional to the YTO frequency) which goes to the YIG Driver Assembly to control the YTO frequency is selected by the FREQUENCY SPAN MODE switch from one of three sources, depending on whether the analyzer is in PER DIV, FULL BAND, or 1.7 — 22 GHz SPAN mode. This signal is also applied to the YTF N/5 Attenuator circuit, which attenuates and offsets it according to the FREQUENCY BAND GHz setting. The output of this circuit is the YTF FREQ ANALOG signal (proportional to the YTF frequency) which goes to the YIG Driver Assembly to control the frequency of the YTF. The Center Frequency N/5 Attenuator circuit attenuates and offsets the voltage from the TUNING controls to provide an output proportional to the center (or marker) frequency of the analyzer.

The capacitors across the inputs of U2 through U7 reduce the susceptibility of these op amps to external RF interference.

+10V Reference (B)

This circuit is a precise, stable, low-noise +10.000V reference power supply. Its output, the +10V REF voltage, is the input to the +22.3V Reference and −10V Reference supplies. The +10V REF and +22.3V REF voltages go to the coarse TUNING control from which the TUNE voltage is obtained. The +10V REF and −10V REF voltages are also used in the YTF N/5 Attenuator and Center Frequency N/5 Attenuator to produce offsets; and in other assemblies where an accurate, low-noise voltage is required.

VR1 is a temperature-compensated 6.2V zener diode whose current is supplied through R7, which is bootstrapped to the output of op amp U5. R6 and C1 form a low-pass filter which filters out noise generated by VR1. The regulated voltage from VR1 is applied to the positive input of U5. Resistors R9 through R13 form a resistive voltage divider. The op amp output is driven to a level such that the output from the voltage divider, which is applied to the negative input, is equal to the voltage at the positive input. The output is set at +10.000V by means of factory-selected resistor R9 and the +10VR pot R11. R8 is a booster resistor that supplies additional output current for the stage.

+22.3V Reference (A)

This circuit is a precise, low-noise +22.30V reference power supply. Its output, the +22.3V REF voltage, is used along with the +10V REF voltage for generating the TUNE voltage. Op amp U4 is connected as a non-inverting amplifier with a gain (2.230) that is determined solely by R1 and R2 (unless the analyzer is in FREQUENCY BAND GHz .01 —1.8). The input is +10.000V, so the output is +22.30V. When FREQUENCY BAND GHz is set to .01 — 1.8,the B1 line is activated (+15V), which biases FET Q1 on. This shunts R5 across R1, which lowers the gain of the stage to 1.935; thus, the output voltage is +19.35V.

−10V Reference (C)

This circuit is a precise, low-noise −10.00V reference power supply. Its output, the −10V REF voltage, is used in the YTF N/5 Attenuator and Center Frequency N/5 Attenuator to produce offsets. This voltage is also used in other assemblies where a precise, low-noise voltage is required. Op amp U7 is connected as an inverting unity gain amplifier. The input is +10.000V, so the output is −10.000V.

TUNE Buffer (D)

The +22.3V REF AND +10V REF voltages go to the coarse TUNING and FINE TUNING controls at the front panel. The coarse TUNING control sets the center frequency in PER DIV mode and sets the marker frequency in the FULL BAND, PER DIV F, and 1.7 — 22 GHz SPAN modes. Op amp U5 is connected as a non-inverting, unity gain buffer. The output from +10V to +22.3V (+10V to +19.35V for FREQUENCY BAND GHz .01 —1.8) depends on the setting of the coarse TUNING control. The output from U6, the BUFF TUNE signal, goes to the Sweep + Tune Summer, where it is summed with the MAIN ATTEN SWP signal from the Sweep Attenuator Assembly. It also goes to the Center Frequency Inverter, where it eventually determines the FREQUENCY GHz readout at the front panel. The BUFF TUNE signal also goes to the Full Multiband Assembly, where it is used in the Full Marker Circuit.

Sweep + Tune Summer (F)

This stage sums the BUFF TUNE signal from the TUNE Buffer (which is proportional to center frequency in PER DIV mode) with the MAIN ATTEN SWP signal from the Sweep Attenuator Assembly (which is proportional to frequency span). Op amp U3 is connected as an inverting amplifier with unity gain for both input signals. In PER DIV mode, the output PER DIV SWEEP + TUNE signal is connected to the YTO FREQ ANALOG line, which goes to the YIG Driver Assembly where it controls the frequency of the YTO.

Span Mode Switch (G)

This stage functions as a switch in which one of three input signals is connected to the output. The output is the YTO FREQ ANALOG signal (proportional to the YTO frequency), which goes to the YIG Driver Assembly where it controls the frequency of the YTO. This line also goes to the YTF N/5 Attenuator, the output of which goes to the YIG Driver Assembly to control the frequency of the YTF.

The output of the Span Mode Switch is selected from the three input signals PER DIV SWEEP + TUNE, FULL FREQ ANALOG, and MULTIBAND FREQ ANALOG by turning on one of three FET switches Q2, Q4, or Q6. With the analyzer in PER DIV mode, the FULL and MULTIBAND lines are not activated (open circuit at front panel), and Q22 is turned off, which turns off Q3. The Per Div FET Q2 is then turned on by the gate-source resistor R24. The PER DIV SWEEP + TUNE signal is thus applied to the input of U2. With the analyzer in FULL BAND or PER DIV F, the FULL line is activated (+15V). This turns Q22 on, turning Q3 on. The −35V applied through Q3 biases Per Div FET Q2 off. The FULL line also turns off Q5. Full FET Q4 is then turned on by the gate-source resistor R28. Thus, the FULL FREQ ANALOG signal from the Full Multiband Assembly is applied to the input of U2. With the analyzer in 1.7 — 22 GHz SPAN mode, the MULTIBAND line is activated (+15V). This turns Q22 off, turning Q3 on. The −35V applied through Q3 biases Per Div FET Q2 off. The MULTIBAND line also turns off Q7. Multiband FET Q6 is then turned on by the gate-source resistor R31. Thus, the MULTIBAND FREQ ANALOG signal from the Full Multiband Assembly is applied to the input of U2.

Op amp U2 is connected as a non-inverting, unity gain buffer. The output of U2 is the YTO FREQ ANALOG signal, which is a precise voltage proportional to the frequency of the YTO. The sensitivity at this point is −5 mV per MHz for fundamental frequency of the YTO. This sensitivity is divided by the harmonic number N for the harmonic mixing frequency bands (see schematic Notes 6 and 7).

The YTO FREQ ANALOG signal goes to the following assemblies:

1. YIG Driver Assembly, where it controls the frequency of the YTO by controlling the current in the Main Coil of the YTO;
2. Bias Assembly, where it controls (as a function of frequency) the FLATNESS signal to the Variable Gain Amplifier Assembly, which controls the IF gain to compensate for losses in the RF circuitry;
3. Full Multiband Assembly, where it is used in the Oversweep Blanking Circuit.

The YTO FREQ ANALOG also is applied to the YTF N/5 Attenuator circuit, the output of which is the YTF FREQ ANALOG signal (proportional to the frequency of the YTF).

YTF N/5 Attenuator (H)

THE YTO FREQ ANALOG signal from the FREQUENCY SPAN MODE switch goes to this stage, where it is attenuated and offset an amount selected by the band lines B1 through B8, from the FREQUENCY BAND GHz switch. The output of this stage is the YTF FREQ ANALOG signal (proportional to the YTF frequency) that goes to the YIG Driver Assembly, where it controls the frequency to which the YTF is tuned.

The YTF N/5 Attenuator circuit has op amp U8 connected as an inverting amplifier in which different sets of input and feedback resistors are selected by FET switches. There are five nearly identical sections, which are switched in one at a time. They provide inverted gains of N/5 where N = 1 to 5. The operation of the N = 2− section will be described. When the B3 line is not activated (open circuit at the front panel), Q11 has approximately −15V at both the base and the emitter; this is enough reverse bias at the gate of Q10 to keep it turned off. Pull-down resistor R87 in the Center Frequency N/5 Attenuator circuit provides −15V for the B3 line.

When the B3 line is activated (+15V), Q11 is turned on with the base at approximately +0.6V and the emitter at 0V, connecting the gate of Q10 to ground. Now Q10 is no longer reverse biased by R45 but is turned on because the source and gate are at the same potential. (The source is at a virtual ground because of the operation of U8.) With Q10 on, the input resistors R41 through R43 and the feedback resistor R44 are connected to the negative input of U8, giving an inverted gain of 0.4 (2/5) to the YTO FREQ ANALOG signal. R41 provides an offset to account for the 321.4 MHz IF offset frequency between the YTF frequency and the YTO frequency (or the harmonic frequency of the YTO for harmonic mixing bands). The polarity of this offset is reversed for the N = 4+ and N = 5+ sections (see schematic Note 7). YTF OFFSET N2 potentiometer R43 provides a slight adjustment in offset to compensate for hysteresis effects in the YTF.

With Q10 on, CR7 has no effect; but when Q10 and this section are off, CR7 clamps the drain voltage of Q10 at −0.6V. This prevents Q10 from being turned on during part of a span because of the signal from the output of U8 being applied through R44. This diode is not necessary for the N = 1− section.

When the B1, B2, B7 or B8 line is activated (+15V) the N = 1− section is switched in, giving an inverted gain of 0.2 (1/5) to the YTO FREQ ANALOG signal. The B4, B5, and B6 lines respectively switch in the N = 3−, N = 4+, and N = 5+ sections for inverted gains of 0.6, 0.8, and 1.

The YTF CORRECT signal from the Tuning Stabilizer Control Assembly is summed at the input of U8 through R68. This signal is proportional to the frequency change in the YTO caused by the Tickler Coil. The frequency change caused by this signal can be a maximum of ±10.5 MHz.

The output of U8 is the YTF FREQ ANALOG signal, which is a precise voltage proportional to the frequency of the YTF. (Hysteresis effects of the YTF between frequency bands, as compensated for by the YTF OFFSET adjustments N2 through N5, cause a slight discrepancy in this proportionality). The tuning sensitivity at this point is +1 mV per MHz of frequency at the YTF. The YTF FREQ ANALOG signal goes to the YIG Driver Assembly, where it determines the frequency to which the YTF is tuned by controlling the current in the Coil of the YTF, and to the Full Multiband Assembly, where it is used in the Multiband Marker circuit.

Center Frequency Inverter (E)

The BUFF TUNE signal from the TUNE Buffer is inverted to apply the correct polarity to the Center Frequency N/5 Attenuator. Op amp U1 is connected as an inverting amplifier with unity gain for this signal. The CENTER FREQ CORRECT signal is summed in at this stage. This signal, which comes from the Tuning Stabilizer Control Assembly, is the summation of three signals: those from the FREQ CAL and FINE TUNING controls at the front panel, and the ERROR signal in the stabilized mode. R20 is a booster resistor that supplies additional output current for the stage. The output of the Center Frequency Inverter goes to the Center Frequency N/5 Attenuator.

Center Frequency N/5 Attenuator (I)

The output from the Center Frequency Inverter goes to the Center Frequency N/5 Attenuator, where it is attenuated and offset an amount selected by the band lines B1 through B8, from the FREQUENCY BAND GHz switch, and the MULTIBAND line. The output of this stage is the CENTER FREQUENCY signal (proportional to the center frequency to which the analyzer is tuned) that goes to the DVM Analog Assembly, which in conjunction with the DVM Digital Assembly provides the FREQUENCY GHz readout.

The Center Frequency N/5 Attenuator has op amp U9 connected as an inverting amplifier, in which different sets of input and feedback resistors are selected by FET switches. There are nine nearly identical sections, which are switched in one at at a time. Six of the sections provide inverted gains of N/5 where N = 1 to 5, and two sections provide inverted gains of N/50 where N = 6 and 10. Offsets equivalent to ±321.4 MHz or ±2050 MHz are summed in depending on the FREQUENCY BAND GHz setting (see schematic Note 7). There is also a Multiband section, which is switched in to read out the marker frequency in the 1.7 — 22 GHz SPAN mode. The operation of the N = 2− section will be described.

A15 Sweep Attenuator Assembly
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When the B3 line is not activated (open circuit at the front panel), Q19 has approximately −15V at both the base and the emitter; this is enough reverse bias at the gate of Q18 to keep it turned off. R87 is a pull-down resistor which provides −15V for the B3 line.

When the B3 line is activated (+15V), Q19 is turned on with the base at approximately +0.6V and the emitter at 0V, connecting the gate of Q18 to ground. Now Q18 is no longer reverse biased by R85 but is turned on because the source and gate are at the same potential. (The source is at a virtual ground because of the operation of U9.) With Q18 on, the input resistors R82 and R83 and the feedback resistor R84 are connected to the inverting (−) input of U9, giving an inverted gain of 0.4 (2/5) to the signal from the Center Frequency Inverter. R83 provides an offset to account for the 321.4 MHz IF offset frequency between the center frequency and the YTO frequency (or the harmonic frequency of the YTO for the harmonic mixing bands). The polarity of this offset is reversed for bands B5, B6, B7, and B8 and is equivalent to 2050 MHz for B1, B7, and B8 (see schematic Note 7).

With Q18 on, CR13 has no effect; but when Q18 and this section are off, CR13 clamps the drain voltage of Q18 at −0.6V. This prevents Q18 from being turned on during part of a span because of the signal from the output of U9 being applied through R84. (This diode is not necessary for some sections.) CR14 is connected to Q36, which when the MULTIBAND line is activated applies −15V to this diode to keep Q19 off and hence Q18 off in the 1.7 — 22 GHz SPAN mode. The B3 line is activated during part of the multiband span; this keeps the N = 2− section from being turned on when only the Multiband section should be on.

The B1, B2, B4, B5, B6, B7, and B8 lines respectively switch in the N = 1- (2050), N = 1-, N = 3-, N = 4+, N = 5+, N = 6+, and N = 10+ sections for inverted gains of 0.2, 0.2, 0.6, 0.8, 1, 0.12, and 0.2. (For the N = 6+ and N = 10+ sections, this stage has a gain of N/50 instead of N/5, which is the gain for the other sections.) When the Multiband line is activated (+15V), Q36 is turned on to keep all the other sections off. The Multiband section provides a gain and offset such that the output of U9 goes over a range of slightly more than +1.7V to +22V for the full range of the coarse TUNING control.

CF OFF potentiometer R125 is adjusted to zero the offset voltage of U9, eliminating the error that would otherwise be introduced in switching between sections. Q35 is a booster transistor that increases the positive voltage output current capability of the stage. R126 is in series with the postive power input to U9. As the current is increased in R126 to approximately 3 mA because of the increased current load at the output of U9, Q35 is slightly turned on, supplying some of the output current. As more current is required, the voltage across R126 increases, and Q35 provides a greater proportion of the output current.

The output of U9 is the CENTER FREQ signal, which is a precise voltage proportional to the center frequency to which the analyzer is tuned in PER DIV mode or proportional to the marker frequen-

cy in the FULL BAND, PER DIV F, and 1.7 — 22 GHz SPAN modes. The sensitivity at this point is +1 mV per MHz. The CENTER FREQ signal goes to the DVM Analog Assembly, which with the DVM Digital Assembly measures this voltage and digitally displays it as the FREQUENCY GHz readout. The CENTER FREQ signal also goes to the Full Multiband Assembly, where it is used in the Multiband Marker circuit.

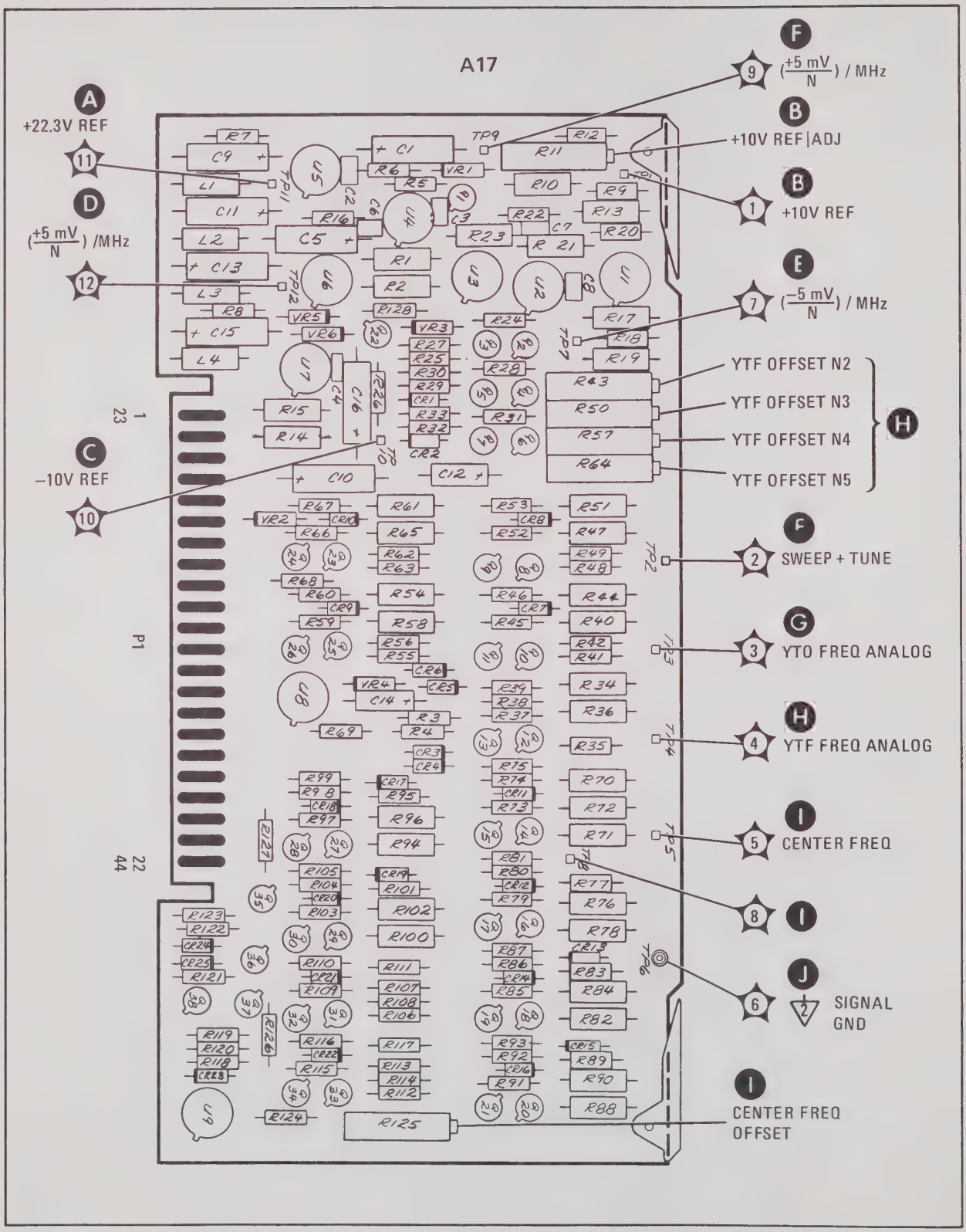

Figure 8-30. A17 Frequency Control Assembly, Component Locations

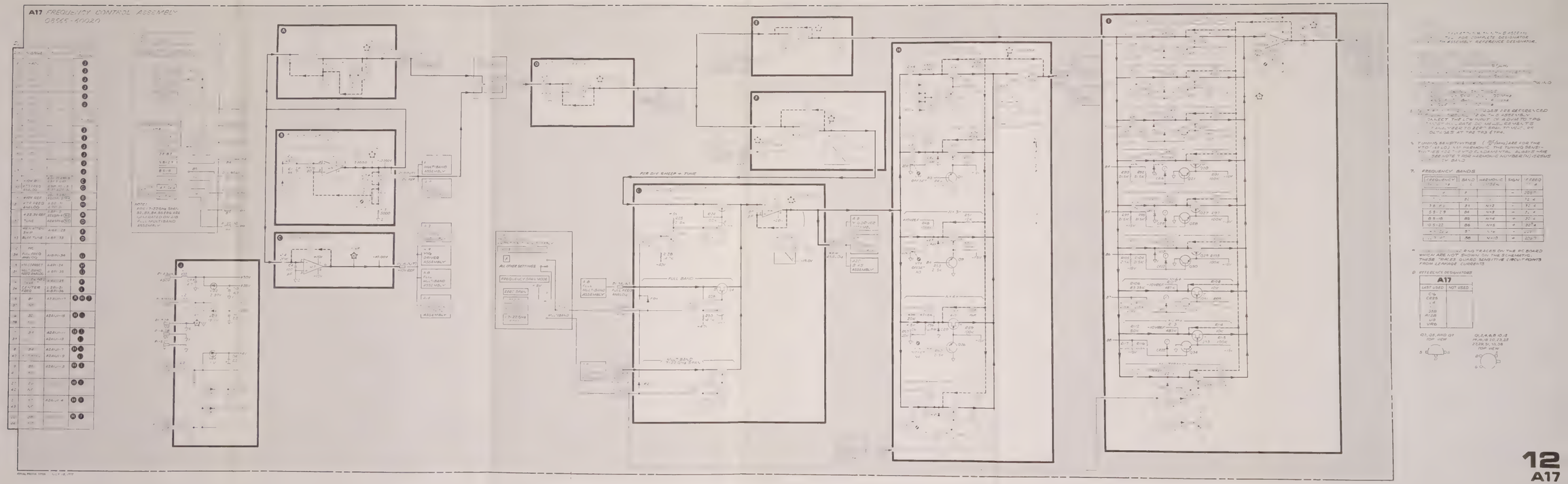

Figure 8-31. A17 Frequency Control Assembly, Schematic Diagram

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A18 FULL MULTIBAND ASSEMBLY, CIRCUIT DESCRIPTION

The Full Multiband Assembly contains circuits for spectrum analyzer operation in the full band modes of FULL BAND and PER DIV F (FREQUENCY SPAN/DIV in F) and also in the multiband mode 1.7 — 22 GHz SPAN. For the full band modes, the SWEEP from the Sweep Generator Assembly is offset and amplified in the FULL Sweep Amplifier to provide the FULL FREQ ANALOG signal to the Frequency Control Assembly. There is also circuitry to control the Auto Sweep Time (AST) and to generate a marker for the full band modes.

In the multiband mode, the SWEEP ramp from the Sweep Generator Assembly is offset and amplified. Band Edge Comparators compare this ramp against fixed voltages that control the band transitions. The frequency band lines are sequentially switched by Band Logic circuits to display all five frequency ranges on a single sweep. The SWEEP ramp goes through a switched gain 5/N Amplifier, controlled by the frequency band lines, which then provides the MULTIBAND FREQ ANALOG signal to the Frequency Control Assembly. The frequency band lines also go to other assemblies to control mixer diode bias, flatness gain compensation, and the YTF N/5 Attenuator. There is also circuitry to generate the multiband marker. In PER DIV mode, there is an Over Sweep blanking circuit that blanks the CRT trace when the frequency is swept beyond the frequency band edges.

Sweep + Offset Amplifier (A)

This circuit amplifies and offsets a sweep ramp to produce a ramp for the multiband 1.7 — 22 GHz SPAN. The SWEEP ramp input (−5V to +5V) comes from the Sweep Generator Assembly. This signal goes to the negative input of op amp U4B. A reference voltage (+10V REF) from the Frequency Control Assembly also goes to the negative input of U4B, which is connected as an inverting amplifier with an inverted gain of 2.1 for sweep and 1.21 for the offset. When the MULTIBAND line is not activated (open circuit at the front panel), −15V through R3 and CR2 is applied to the negative input of U4B, which offsets the multiband ramp sufficiently so that none of the Band Edge Comparators will be driven positive. When the 1.7 — 22 GHz SPAN mode is selected, the MULTIBAND line is activated (+15V), CR2 is reverse biased, and R3 causes no offset. Op amp U3A is a unity gain inverting amplifier. Its output is the MB RAMP, which has a voltage range of +1.7V to +22.5V (see Figure 8-32).

Band Edge Comparators (B)

This circuit consists of four comparators that sequentially go positive at the frequency band switching points of the multiband span. The +22.3V REF voltage from the Frequency Control Assembly is applied to the resistive voltage divider consisting of R7 through R11. Voltages from this divider go to the negative inputs of op amps U1A, U1B, U2A, and U2B, which are connected as voltage comparators. The multiband sweep, MB RAMP, from the output of U3A is applied to the positive inputs of U1A, U1B, U2A, and U2B. The output of each comparator is approximately −3V when the positive input is at a lower voltage than the negative input. When the voltage at the positive input exceeds that at the negative input, the output will be approximately +24V. The op amps U1B, U1A, U2B, and U2A go positive in sequence during a single sweep ramp. The output of each remains positive until the next sweep ramp is started (see Figure 8-32). The comparator outputs go to both the Band Logic and the Stop Sweep triggers.

Band Logic (C)

The outputs of the Band Edge Comparators (U2A, U2B, U1A, and U1B) drive the Band Logic transistors, where five band lines (B2 through B6) are activated in sequence during one multiband sweep (see Figure 8-32). When the outputs of all comparators are negative, Band 2 transistor Q5 is turned on providing +14V on line B2. The emitter of Q5 is at +14V only when the MULTIBAND line is activated (+15V); otherwise it is open. When the output of U1B goes positive (+24V), Q5 is turned off and the inverter Q24 is turned off, which turns on Q4 to provide +15V on line B3. At the next band edge, when U1A has a positive output, Q4 is turned off by this voltage applied through CR8. Q23 is also turned off, which turns on Q3 to provide +15V on line B4. The circuits for Band 5 and Band 6 work in the same manner. In the multiband mode, the FREQUENCY BAND GHz switch on the front panel is disconnected and the band lines activated in this circuit go to other assemblies to control mixer diode bias, flatness gain compensation, and the N/5 Attenuaor.

Stop Sweep Triggers (E)

The Band Edge Comparators drive the Stop Sweep Triggers, which stop the sweep for approximately 15 ms while the spectrum analyzer is switching from one band to the next (see Figure 8-32). Since there are four identical Stop Sweep Triggers, the operation of only one of these will be described. When the output of U2A goes from negative to positive, this transition is coupled through C1 and R31 to the base of Q21, momentarily turning it on. This shunts the collector of Q21 to ground, which turns on Q25. When Q25 is on, +25V is applied through CR14 to the Sweep Generator Assembly, where this STOP SWP signal stops the sweep at its current level and holds it there until the line is opened. The output from Q25 is also ORed into the OVER SWP BLANK line through CR13 so that the CRT is blanked while the sweep is stopped.

5/N Amplifier (F)

The multiband sweep, MB RAMP (+1.7V to +22.5V) from the Sweep + Offset Amplifier circuit goes to the 5/N Amplifier, where it is amplified and offset an amount selected by the band lines B2 through B6, which are activated in the Band Logic circuit. These band lines are activated in sequence during a single sweep.

The output of this stage is the MULTIBAND FREQ ANALOG signal (proportional to the YTO frequency) that goes to the Frequency Control Assembly, where it is switched to the YTO FREQ ANALOG line (see Figure 8-32). The YTO FREQ ANALOG signal then goes to the YIG Driver Assembly to drive the YTO Main Coil. The MULTIBAND FREQ ANALOG signal has a level of −5 mV per MHz divided by the harmonic number N (see schematic Notes 5 and 6).

The 5/N Amplifier circuit has op amp U4A connected as an inverting amplifier in which different sets of input and feedback resistors are selected by FET switches. There are five nearly identical sections, which are switched in one at a time. They provide inverted gains of 5/N, where N = 1 to 5. The operation of the N = 5 section will be described. When the B6 line is not activated (open circuit at the source in the Band Logic circuit), Q16 has approximately −15V at both the base and the emitter. This is enough reverse bias at the gate of Q15 to keep it turned off. There is a pull-down resistor to −15V for the B6 line, which is located in the Frequency Control Assembly.

When the B6 line is activated (+15V), Q16 is turned on with the base at approximately +0.6V and the emitter at 0V, connecting the gate of Q15 to ground. Now Q15 is no longer reverse biased by R45 but is turned on because the source and gate are at the same potential. (The source is at a virtual ground because of the operation of U4A.) With Q15 on, the input resistors R41 and R43 and the feedback resistor R42 are connected to the negative input U4A, giving an inverted gain of 1 (5/5) to the sweep ramp. R43 provides an offset to account for the 321.4 MHz. It also provides a slight overlap of frequencies between bands to insure that there will be no gaps.

With Q15 on, CR15 has no effect; but when Q15 and this section are off. CR15 clamps the drain voltage of Q15 at −0.6V. This prevents Q15 from being turned on during part of a span because of the signal from the output of U4A being applied through R42. This diode is not necessary for the N = 1 section.

When the B5 line is activated (+14V) the N = 4 section is switched in, giving an inverted gain of 1.25 (5/4) to the sweep. The B4, B3, and B2 lines respectively switch in the N = 3, N = 2, and N = 1 sections for inverted gains of 1.67, 2.5 and 5.

Oversweep Blanking (D)

This circuit provides a blanking signal which goes to the Z Axis Amplifier Assembly and blanks the CRT when the frequency is swept more than a slight margin beyond the band edges. Nominally it blanks the CRT when the sweep exceeds the frequency range of the coarse TUNING control, which is slightly larger than the specified band edges. The YTO FREQ ANALOG signal from the Frequency Control Assembly is applied to the negative input of U3B, which is connected as an inverting unity gain amplifier. The output from U3B goes to the positive input of U7A and to the negative input of U7B, which are op amps connected as comparators. Reference voltage +10V REF is applied to the positive input of U7B and reference voltage +22.3V REF to the negative input of U7A. These two voltages are the voltages at the ends of the coarse TUNING potentiometer. For a sweep plus tune voltage at output of U3B between +10V and +22.3V, the outputs of both U7A and U7B are negative (about −3V) and are isolated from the OVER SWP BLANK line by CR11 and CR12. If the output of U3B is less than +10V, U7B goes positive to about +24V for that part of the frequency span. The output of U7B goes through CR12 and R30 to the Z Axis Amplifier Assembly, blanking the CRT. If the output of U3B is greater than +22.3V, U7A goes positive to about +24V for that portion of the frequency span. The output of U7A goes through CR11 and R30 to the Z Axis Amplifier Assembly to blank the CRT. For narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) and for the ZERO SPAN mode, the NARROW line is activated (+15V), which turns on Q2 and shunts the OVER SWP BLANK line to ground. This disables the oversweep blank function for narrow frequency spans. For wide frequency spans, the blanking is never for more than approximately half the CRT trace.

Full Sweep Amplifier (H)

This SWEEP ramp from the Sweep Generator Assembly goes to this stage, where it is amplified and offset an amount as selected by the band lines B1 through B8 from the FREQUENCY BAND GHz switch. The output of this stage is the FULL FREQ ANALOG signal (proportional to the YTO frequency) that goes to the Frequency Control Assembly, where it is switched to the YTO FREQ ANALOG line. The YTO FREQ ANALOG signal then goes to the YIG Driver Assembly to drive the YTO Main Coil.

This stage has op amp U8A connected as an inverting amplifier in which different sets of input and feedback resistors are selected by FET switches. There are three nearly identical sections, which are switched in one at a time. These sections are similar to those in the 5/N Amplifier circuit. (Refer to that circuit for operation of a typical section.) When the B1 line is activated (+15V), the B1 section is switched in, giving an inverted gain of 0.91 for the sweep and 1.47 for +10V REF. When the B2, B3, B4, or B5 line is activated (+15V), the corresponding section is switched in, giving an inverted gain of 1.22 for the sweep and 1.61 for +10V REF. When the B6, B7 or B8 line is activated (+15V), the corresponding section is switched in, giving a gain of 1.16 for the sweep and 1.59 for +10V REF. The FULL FREQ ANALOG output is −5 mV per MHz divided by the harmonic number N (see schematic Notes 5 and 6).

AST Full Span (G)

With the SWEEP TIME/DIV switch set to AUTO, the sweep time is automatically controlled by the Auto Sweep Time (AST) circuits. The sweep time is varied as a function of RESOLUTION BW, FREQUENCY SPAN/DIV, and VIDEO FILTER settings to maintain absolute amplitude calibration. In the PER DIV F mode, this circuit controls the sweep time as a function of the FREQUENCY BAND GHz setting. In the FULL BAND mode, the circuit is switched in but has no effect on sweep time because the RESOLUTION BW and VIDEO FILTER are fixed respectively at 3 MHz and .003. Under these conditions the sweep time is determined solely by the Current Limit circuit in the Sweep Generator Assembly.

In FULL BAND or PER DIV F, the FULL line is activated (+15V), and this signal through CR39 turns on Q33 to connect CR21, CR22, CR23, CR24, CR25, and CR26 to ground.

There are six identical AST switches for the bands B1 through B6 (see schematic Note 6). The operation of the Band 6 AST circuit will be described. When Band 6 is selected (10.5 — 22 GHz) by the FREQUENCY BAND GHz switch, the B6 line is activated (+15V), which turns on Q27 to connect the Band 6 AST resistor R68 to ground through CR21 and Q33. The other end of R68 is connected through CR19 to the AST BW-FS line. Switching the AST resistors in controls the current in the AST BW-FS line, which in turn controls the sweep time of the sweep ramp generated in the Sweep Generator Assembly. The lower the resistance, the faster the sweep speed.

Multiband Marker (I)

This circuit provides the marker for the multiband 1.7 — 22 GHz SPAN mode. When not in 1.7 — 22 GHz SPAN, the MULTIBAND line is not activated, and −15V through R100 and CR35 is applied to the negative input of U5A, which offsets the ramp sufficiently to disable the Multiband marker. When the MULTIBAND line is activated (+15V), CR35 is reverse biased, and R100 causes no offset. Op amp U8B is an inverting unity gain amplifier that inverts the YTF FREQ ANALOG signal from the Frequency Control Assembly. This signal is proportional to the frequency to which the spectrum analyzer is swept in the multiband mode (−1 mV/MHz at the output of U8B). Op amp U5A is an inverting amplifier with a gain of 50. The CENTER FREQ line from the Frequency Control Assembly is proportional to the FREQUENCY GHz readout (+1 mV/MHz). The YTF FREQ ANALOG and CENTER FREQ voltages are summed through R98 and R99 at the negative input of U5A. When the two inputs are near the same absolute level, the output of U5A is a positive-going ramp. The output of op amp U5B, an inverting unity gain amplifier, is a negative-going ramp when the output of U5A is a positive-going ramp. As long as the output of U5B is greater than that of U5A, the output at the junction of CR36 and CR37 will be a negative-going ramp from U5B. When the output of U5B is less than that of U5A, the output at the junction of CR36 and CR37 will be a positive-going ramp from U5A. This generates a positive V-shaped pulse with its apex at 0v. R104 and R105 offset the "V" pulse so that its apex is at approximately −6V. CR38 allows this marker to be ORed with the Full Marker. The MARKER pulse generated goes to the Video Assembly, where it is added to the vertical signal to produce a "V" notch marker on the CRT trace at the frequency corresponding to that on the FREQUENCY GHz display.

A17 Frequency Control Assembly
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Full Marker (J)

This circuit provides the marker in the full span modes of FULL BAND and PER DIV F. When not in a full span mode, the FULL line is not activated and −15V through R108 and CR40 is applied to the negative input of U6A, which offsets the ramp sufficiently to disable the FULL marker. When in a full span mode, the FULL line is activated (+15V), CR40 is reverse biased, and R108 causes no offset. Op amp U6A is an inverting amplifier with a gain of 50. The BUFF TUNE signal from the Frequency Control Assembly is proportional to the FREQUENCY GHz readout and also to the center frequency in PER DIV mode (+5 mV/MHz). The FULL FREQ ANALOG signal is proportional to the frequency to which the spectrum analyzer is swept in the full band modes (−5 mV/MHz). The BUFF TUNE and FULL FREQ ANALOG voltages are summed through R106 and R107 at the negative input of U6A. When the two inputs are near the same absolute level, the output of U6A will be a positive-going ramp. The output of op amp U6B, an inverting unity gain amplifier, is a negative-going ramp when the output of U6A is a positive-going ramp. As long as the output of U6B is greater than the output of U6A, the signal at the junction of CR41 and CR42 will be a negative-going ramp from the output of U6B. When the output of U6B is less than that of U6A, the output at the junction of CR41 and CR42 will be a positive-going ramp taken from U6A. This generates a positive V-shaped pulse with its apex at 0V. R112 and R113 offset this "V" pulse so that its apex is at approximately −6V. CR43 allows this marker to be ORed with the Multiband Marker. The MARKER pulse generated goes to the Video Assembly, where it is added to the vertical signal to produce a "V" notch marker on the CRT trace at the frequency corresponding to that on the FREQUENCY GHz display.

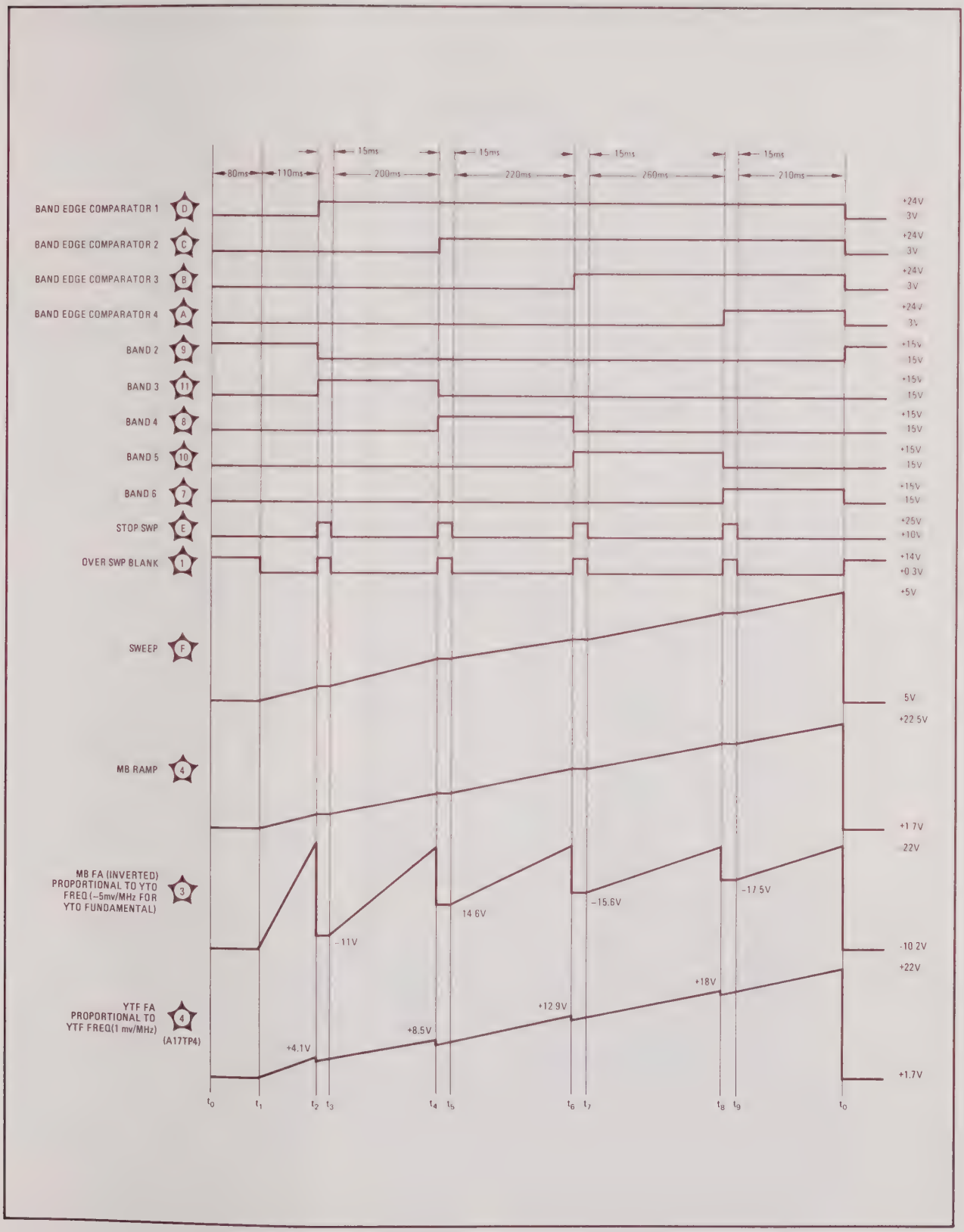


Figure 8-32. A18 Full Multiband Assy, Timing Diagram

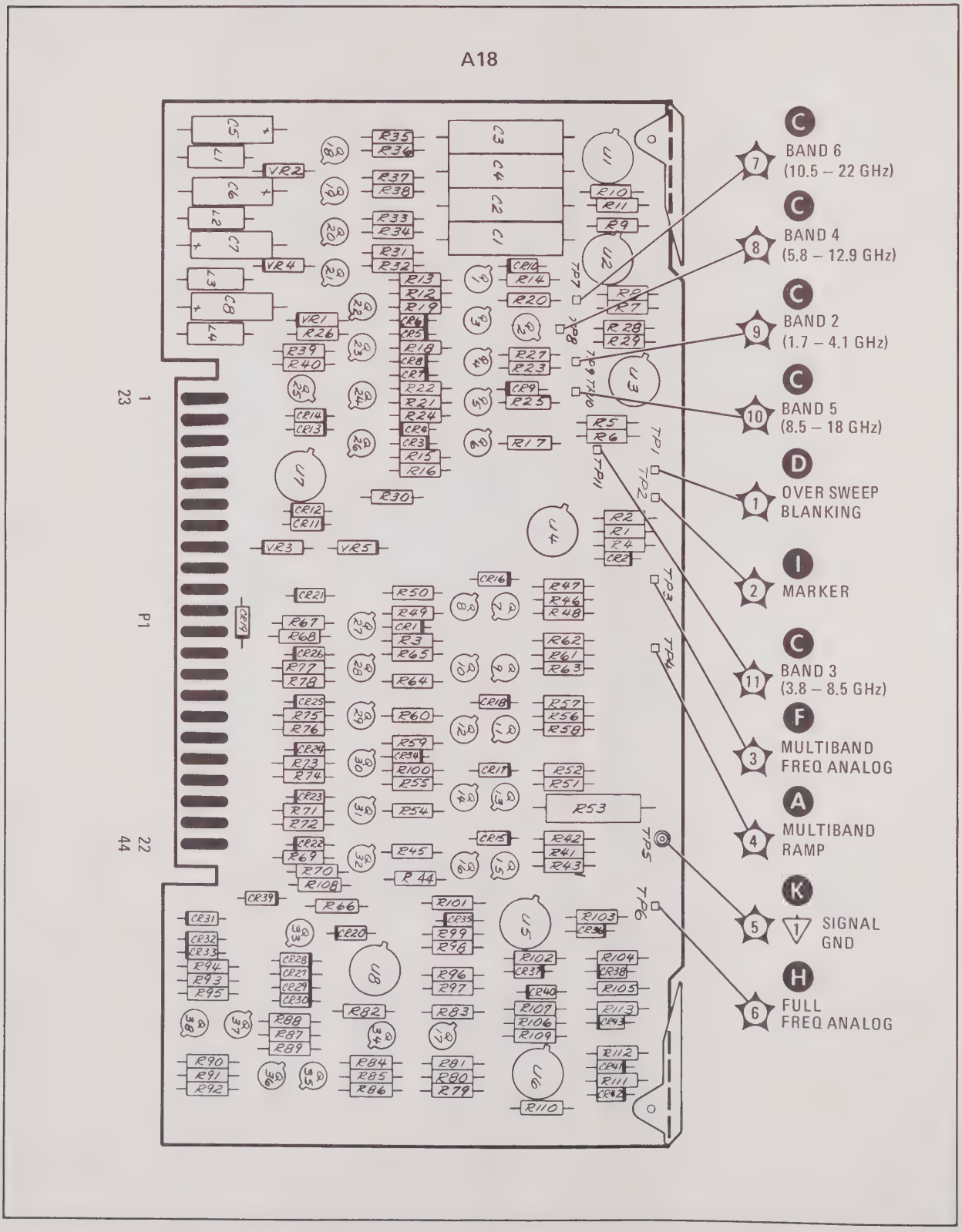
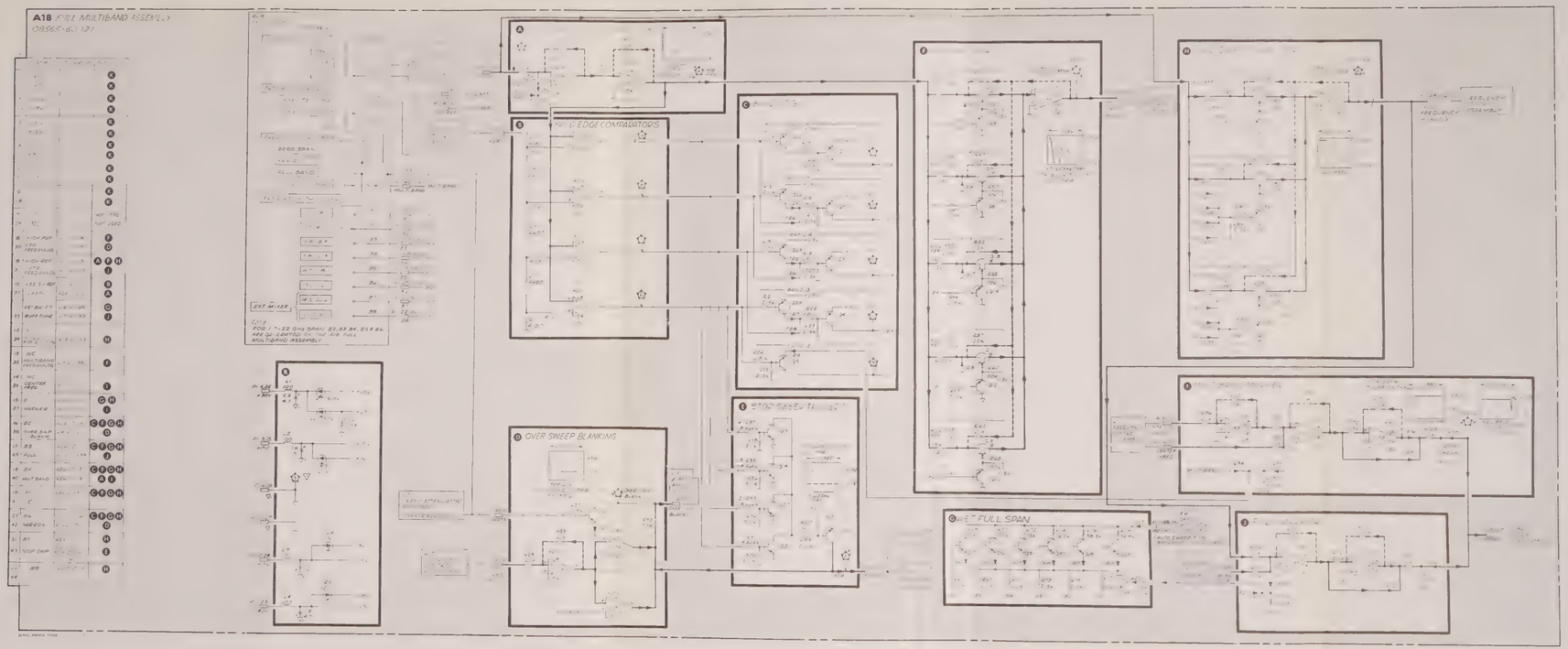


Figure 8-33. A18 Full Multiband Assembly, Component Locations



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A18

Figure 8-34. A18 Full Multiband Assembly, Schematic Diagram

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A19 YIG DRIVER ASSEMBLY, CIRCUIT DESCRIPTION

The YIG Driver Assembly contains circuits that tune the YIG-Tuned Oscillator (YTO) over the frequency range from 2.00 GHz to 4.46 GHz. Tuning is accomplished by controlling the current (which is proportional to frequency) in the YTO Main Coil. Also in this assembly are the circuits that tune the YIG-Tuned Filter (YTF) preselector over the frequency range from 1.7 GHz to 22 GHz. Tuning is accomplished by controlling the current (which is proportional to frequency) in the YTF coil. E1 through E14 are insulated terminals that are used to reduce leakage currents to sensitive signal paths.

–20V Reference Supply (A)

Op amp U1 is connected as a non-inverting amplifier with a gain of 2. A reference voltage (–10V REF) from the Frequency Control Assembly is applied to the non-inverting (+) input of U1, providing a –20.0V reference voltage at the output.

YTO Main Coil Predriver (B)

The main input to this stage is the YTO FREQ ANALOG signal which comes from the Frequency Control Assembly. This is a precise voltage equal to –5 mV per MHz for fundamental (N = 1) mixing mode. For harmonic mixing bands, this voltage is divided by the harmonic number N (see schematic Notes 5 and 6). For narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) and for ZERO SPAN mode, the voltage from the TUNING control determines the YTO FREQ ANALOG voltage. For wide frequency spans (5 MHz/DIV to 500 MHz/DIV), the attenuated sweep ramp is summed with the voltage from the TUNING control in the Frequency Control Assembly to produce the YTO FREQ ANALOG voltage. For the full band modes (FULL BAND and PER DIV F) and for the multiband mode (1.7 — 22 GHz SPAN), the FULL BAND FREQ ANALOG or the MULTIBAND FREQ ANALOG voltage is generated in the Full Multiband Assembly and switched to the YTO FREQ ANALOG line in the Frequency Control Assembly. The YTO FREQ ANALOG signal goes through R8, R9, and R10 to the negative input of op amp U3. This stage is an inverting amplifier with a gain of 0.5 for the YTO FREQ ANALOG voltage, with the YTO GAIN adjustment R8 at its nominal position.

A reference voltage (–20V REF) from U1 is applied through the voltage divider R4 and R11 to put –10.25V at the positive input of U3. The –20V REF also goes through R5, R6, and R7 to the negative input of U3, where it cancels out most of the offset that was introduced at the positive input. YTO OFFSET adjustment R5 is adjusted to tune the YTO to 2.05 GHz when –10.25V is applied to the YTO FREQ ANALOG input. The negative input of U3 is at a virtual potential equal to the voltage at the positive input of U3 (i.e., –10.25V) because of the operation of the op amp. Thus with the YTO FREQ ANALOG voltage at –10.25V, the YTO GAIN adjustment R8 has no effect because there is no current through it. This makes the YTO GAIN adjustment non-interacting with the YTO OFFSET adjustment when the latter is first adjusted with the YTO FREQ ANALOG voltage at –10.25V. The YTO GAIN adjustment is then adjusted to tune the YTO to 4.4 GHz when –22V is at the YTO FREQ ANALOG input. C1 is placed across the input of U3 to reduce its susceptibility to external RF interference.

YTF Coil Predriver (C)

The main input to this stage is the YTF FREQ ANALOG signal that comes from the Frequency Control Assembly. This is a precise voltage equal to +1 mV per MHz. This voltage varies from +1.7V to +22V as the YTF is tuned from 1.7 to 22 GHz. The YTF FREQ ANALOG signal goes through R17, R18, and R19, and also through R20 and C2 (a speed-up circuit to compensate for some of the magnetic delay in the YTF coil) to the negative input of op amp U4. This stage is an inverting amplifier with a gain of 0.9 for the YTF FREQ ANALOG voltage when the YTF GAIN adjustment R17 is at its nominal position.

The +10V reference voltage (+10V REF) from the Frequency Control Assembly is applied through the voltage divider R13 and R25 to put +2.00V at the positive input of U4. The +10V REF also goes through R14, R15, and R16 to the negative input of U4, where it cancels out most of the offset that was introduced at the positive input. The YTF OFFSET adjustment R14 is adjusted to tune the YTF to 2.00 GHz when +2.00V is at the YTF FREQ ANALOG input. The negative input of U4 is at a virtual potential equal to the voltage at the positive input of U4 (i.e., +2.00V), because of the operation of the op amp. Thus with the YTF FREQ ANALOG voltage at +2.00V, the YTF GAIN adjustment R17 has no effect because there is no current through it. This makes the YTF GAIN adjustment non-interacting with the YTF OFFSET adjustment when the latter is first adjusted with the YTF FREQ ANALOG voltage at +2.00V. The YTF GAIN adjustment is then adjusted to tune the YTF to 10 GHz when +10.00V is at the YTF FREQ ANALOG input. The YTF GAIN and OFFSET adjustments are made with the PRESELECTOR PEAK control at mid-position. This control allows the tracking of the YTF to the YTO to be adjusted at the front panel for the best performance at the particular signal frequencies of interest. It adjusts the offset of the YTF over a range of approximately ±40 MHz.

The YTF Track switch S1 is switched to the TEST position for adjusting the YTF OFFSET and YTF GAIN adjustments. With the spectrum analyzer in ZERO SPAN and AUTO STABILIZER OFF, a signal is applied to the analyzer input. When the analyzer is tuned to that frequency, the YTF passband at that particular frequency will be swept and displayed on the CRT. This display has a calibration of about 20 MHz/DIV (the actual passband of the YTF is the reverse of that seen on the CRT). In the TEST position of S1, a sweep ramp of –5V to +5V is applied through R21, S1, and R24 to the negative input of U4, sweeping the YTF. In the NORM position of S1, R22 is connected from R24 to ground, thus presenting the same resistance to the negative input of U4 in NORM as in TEST. This is done so there will be no offset difference between the two settings. The YTF MOD input through C3 enables the YTF offset to be modulated for the test purpose of adjusting and checking tracking and amplitude flatness.

YTO Main Coil Driver (D)

The signal from the output of the YTO Main Coil Predriver is applied to op amp U2 of the YTO Main Coil Driver circuit. This driver is basically an accurate constant current source putting a current through the Main Coil of the YTO that is proportional to the input voltage to this stage. Q1, Q2, and Q3 are connected in a three-transistor Darlington configuration to provide the necessary current capability and current source accuracy.

The current through the sense resistor R34, which differs from the current in the Main Coil by only a small amount, produces a voltage across R34 which is sensed differentially. At the transistor side of R34 the signal is applied as negative feedback through R30 to the negative input of U2. A slight amount of positive feedback from the ground side of R34 is applied through R29 to the positive input of U2. This stage has a voltage-to-current conversion of 104 mV/mA. CR1 and VR3 clamp the YTO COIL + voltage during retrace at approximately –125V (–83V across the YTO Main Coil) to provide flyback voltage limiting for Q1, Q2, and Q3. C4 is placed across the input of U4 to reduce its susceptibility to external RF interference.

For narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) and for ZERO SPAN mode, the NARROW line is activated (+14V), turning on relay K1, which shunts R36 to put C5, C6, and C7 (along with the series resistor R35) across the YTO Main Coil. This filter reduces the noise applied to the Main Coil when it is not being swept. R36 allows C5, C6, and C7 to be charged when the relay is open so that there will not be a large jump in frequency when it is closed. CR8 provides flyback voltage clamping of the relay coil.

YTF Coil Driver (E)

The signal from the output of the YTF Coil Predriver is applied to op amp U5 of the YTF Coil Driver. This driver is basically an accurate constant current source putting a current through the YTF Coil that is proportional to the input voltage to this stage. Q4, Q5, and Q6 are connected in a three-transistor Darlington configuration to provide the necessary current capability and current source accuracy.

The current through the sense resistor R59, which differs from the current in the coil by only a small amount, produces a voltage across R59 which is sensed differentially. At the transistor side of R39 the signal is applied as negative feedback through R55 to the negative input of U5. A slight amount of positive feedback from the ground side of R59 is applied through R54 to the positive input of U5. This stage has a voltage-to-current conversion of 67.7 mV/mA. CR7 and VR4 clamp the YTF voltage during retrace at approximately –125V (–83V across the YTF Coil), providing flyback voltage limiting for Q4, Q5, and Q6.

The current versus frequency of the YTF becomes non-linear enough above about 10 GHz to require compensation. The Linearity Correction circuit provides piecewise linearity correction in five segments. Since the same circuit configuration is used for each segment, only the operation for the YTF LIN 18 adjustment will be described. The YTF LIN 18 adjustment R45 is adjusted to track the YTF to the YTO at 18 GHz. The breakpoint of this segment, where it begins to have an effect, is approximately at 16 GHz. R43 and R44 form a voltage divider with a voltage of –4.7V at their junction. When the YTF is tuned to 16 GHz, the voltage at TP8 is –5.3V. This is one diode drop (0.6V) lower than the voltage at the junction of R43 and R44, which (because of CR4) is just enough to start current through R45. R45 and R43 shunt the sense resistor R59, raising the gain of the stage for frequencies above approximately 16 GHz and compensating for the lower tuning sensitivity of the YTF at higher frequencies. For frequencies below 16 GHz, CR4 is reverse biased, and the YTF LIN 18 circuit has no effect.

A18 Full Multiband Assembly
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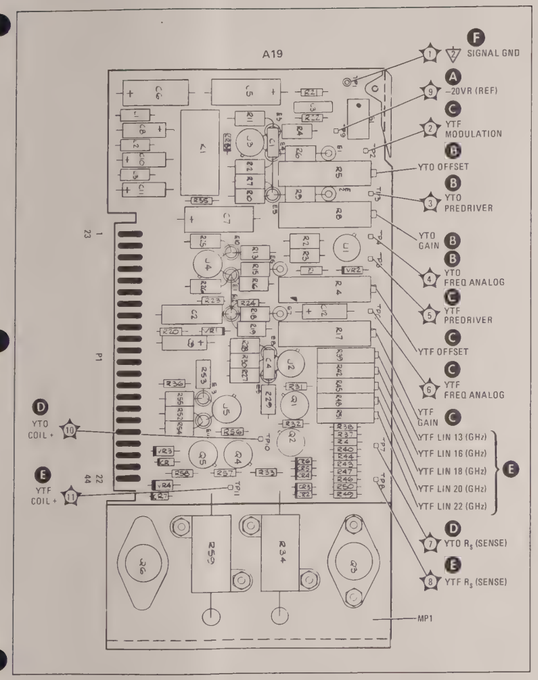
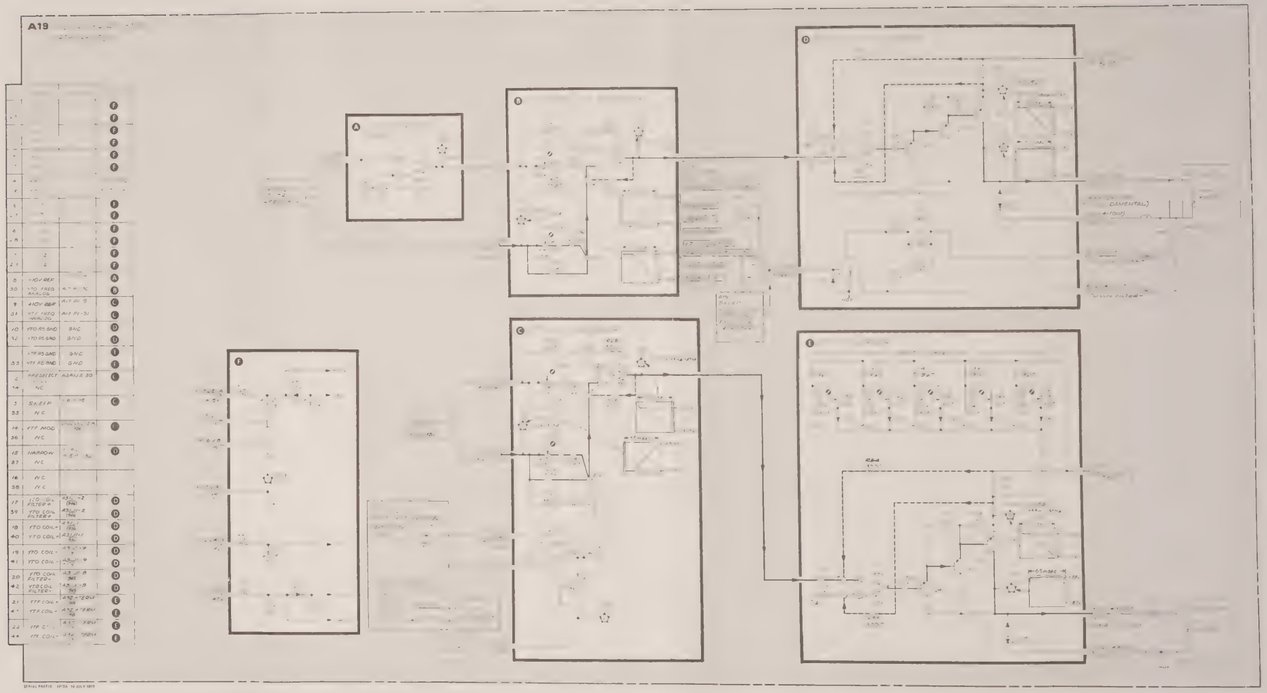


Figure 8-35. A19 YIG Driver Assembly, Component Locations



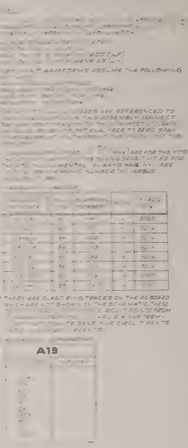


Figure 8-36. A19 YIG Driver Assembly, Schematic Diagram

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A14 TUNING STABILIZER CONTROL ASSEMBLY, CIRCUIT DESCRIPTION

The Tuning Stabilizer Control Assembly contains circuits which tune the YIG-Tuned Oscillator (YTO) over a frequency range of approximately 21 MHz. Tuning is accomplished by controlling current, which is proportional to frequency, in the YTO Tickler Coil. There are three signals which can vary the YTO frequency as controlled by the Tickler Coil: the FINE TUNE signal, the TICK ATTEN SWP signal for narrow frequency spans (1 kHz/DIV to 2 MHz/DIV), and the ERROR signal from the Tuning Stabilizer Assembly. There are two correction circuits that process the signals which control the Tickler Coil. These circuits send center frequency and YTF frequency correction signals to the Frequency Control Assembly.

Also on this board are the tuning stabilizer control circuits that are used only in the AUTO STABILIZER mode. In stabilized operation, the YTO, which is the first LO, is locked to a 1 MHz Voltge-Controlled Crystal Oscillator (VCXO). These circuits are the Control Generator, Error Amplifier, Sample and Hold, VCXO Sweep Inverter, VCXO Sweep Driver, and VCXO Sweep Buffer.

The capacitors across the inputs of U1, U2, U4, U5, U6, U7, and U8 reduce the susceptibility of these op amps to external RF interference.

Tickler Sweep + Tune Summer C

Three signals are summed into op amp U4, which is connected as an inverting summing amplifier: The FINE TUNE signal from the FINE TUNING control at the front panel, the TICK ATTEN SWP from the Sweep Attenuator Assembly, and the −10V REF voltage from the Frequency Control Assembly. The −10 V REF offset voltage is summed in so that the sweep at the output of U4 will be centered about 0V when the FINE TUNING control is set at mid-position. This stage has an inverting gain of 2 for the TICK ATTEN SWP signal. R42 and C8 filter out noise on the FINE TUNE line. The output of this stage goes to both the Tickler Coil Predriver and to the VCXO Sweep Inverter, the latter being used only for stabilized operation.

Tickler Coil Predriver F

The main input to the Tickler Coil Predriver is the output from the Tickler Sweep + Tune Summer. Op amp U7 is connected as an inverting amplifier with a nominal inverted gain of 0.67 to this signal. The TICK SWP adjustment R57 adjusts the gain of this stage to compensate for differences in the tuning sensitivity of the YTO Tickler Coil. It is adjusted to give the correct span for the narrow frequency spans (1 kHz/DIV to 2 MHz/DIV) for unstabilized operation. For unstabilized operation, FET 2 SWITCH Q23 is turned off. Once stabilization is completed, this FET stays on for stabilized operation. With this FET on, the output from the Error Amplifier is summed into the Tickler Coil Predriver. This is the path by which the ERROR signal from the Tuning Stabilizer Assembly is fed back to the YTO to effect changes in its frequency.

Tickler Coil Driver J

The Tickler Coil Driver supplies current to the Tickler Coil of the YTO Assembly. Op amp U2 is basically an inverting, unity gain amplifier. R82 causes the circuit to function as a constant current source whose current is proportional to the voltage at its input. R81 and R77 have little effect on voltage levels but improve the accuracy of the constant current source. The voltage is sensed differentially across R82 with negative feedback through R78 and a slight amount of positive feedback through R81.

R89 and C19 form a 16 kHz low-pass filter which reduces the higher frequency noise applied to the YTO Tickler Coil. Q17 and Q18 are current boosters to provide the required current capability (about 55 mA) for driving the YTO Tickler Coil. When the current through R79, which is in series with the positive power input to U2, reaches approximately 5 mA, there is 0.5V across the base-emitter of Q18, which turns it on slightly, providing added current to the output for positive voltages. As the current requirement increases, the voltge across R79 increases, and Q18 provides a larger proportion of the current. Q17 functions in the same way for the negative output voltages.

Center Frequency Correction Summer G

The output of the Center Frequency Correction Summer is the CENTER FREQ CORRECT signal to the Frequency Control Assembly. Three signals are summed into op amp U3A: The FINE TUNE signal from the front-panel FINE tuning control, the FREQ CAL signal from the front-panel FREQ CAL adjustment, and the output of the Error Amplifier. When the analyzer is in the stabilized mode, if the coarse TUNING control is accidentally moved slightly, an output from the Error Amplifier is generated. The resulting change on the CENTER FREQ CORRECT output of U3A corrects the FREQUENCY GHz readout on the front panel so that it does not change. When the analyzer is in the stabilized mode, if the coarse TUNING control is moved slightly, the lock loop will prevent the YTO frequency from shifting.

YTF Correction Attenuator I

Op amp U3B is connected as an inverting, unity gain amplifier with a gain of 0.2. The YTF CORRECT output signal goes to the Frequency Control Assembly where this signal (proportional to the frequency change in the YTO caused by the Tickler Coil) is added to the YTO FREQ ANALOG signal (proportional to the frequency change in the YTO caused by the Main Coil) so that the YTF will track with the YTO. The YTF CORRECT signal has a maximum effect on the YTF frequency of ±10.5 MHz.

Control Generator A

The Control Generator generates a series of timing pulses to trigger events necessary to accomplish AUTO STABILIZER lock of the YTO, which is the first LO in the analyzer. (See Figure 8-37.) When the analyzer controls are changed from unstabilized to stabilized settings, the TUNE STAB line is activated (+15V) and the timing pulse train, which lasts for about 430 msec, is initiated. The analyzer settings for stabilized mode are: AUTO STABILIZER on (pushbutton out) with analyzer in ZERO SPAN mode or in PER DIV mode with FREQUENCY SPAN/DIV set to 100 kHz/DIV or less (the blue numbered region). When in the stabilized mode, the STABILIZED FINE TUNE ONLY LED is lit. Once the Control Generator has generated a train of pulses and the YTO is stabilized, another train will be generated only if the stabilizer is turned off and back on again.

When the last of the three series-connected switches is closed (FREQUENCY SPAN/DIV, FREQUENCY SPAN MODE, or AUTO STABILIZER), +15V is applied to the TUNE STAB line and the stabilization process begins at this time t_0. At this instant the +15V turns on Q1, which turns on Q2 (+20V Switch), applying +20V to the Tuning Stabilizer Assembly to turn on the VCXO Pulse Amplifier. At the same time, the +20V from Q2 turns off Q10 which then turns on Q9 (Zero Span Driver) to activate the ZERO line (+15V). The ZERO signal goes to the Sweep Attenuator Assembly to put the analyzer in Zero Span mode. This removes sweep from the YTO during the stabilization process. The +15V on the TUNE STAB line charges C1 through R2, turning on Delay 1 transistors Q3 and Q4 30 msec after the TUNE STAB line is activated.

At this time (t_1), the output from Q4 goes to FET 1 Switch Driver Q16, turning it off. FET 1 Switch Q19, part of the Error Amplifier, has been on, shorting the signal to ground. It is turned off by the −15V from the FET 1 Switch Driver. The ERROR AMPL signal from the Error Amplifier is passed through the closed contacts of reed relay K1, through the Sample and Hold, VCXO Sweep Driver and VCXO Sweep Buffer circuits to the VCXO in the Tuning Stabilizer Assembly. This signal causes the VCXO to shift frequency to move a harmonic lock point to the YTO frequency. The +15V from Q4 charges C2 through R6, turning on Delay 2 transistors Q5 and Q6 300 msec after t_1.

At this time (t_2), the +15V output from Q6 turns off Relay Driver Q7, which removes the ground return for relay K1. This opens K1, leaving the ERROR AMPL signal, which was present just before time t_2, stored on C11. The +15V from Q6 charges C3 through R10, turning on Delay 3 transistors Q15 and Q14 30 msec after t_2.

At this time (t_3), +15V from Q14 turns off Q8, which then turns FET 1 Switch Driver Q16 back on. The +15V from Q16 then turns FET 1 Switch Q19 on again to discharge C7 in the Error Amplifier and A36A1C17 in the Tuning Stabilizer Assembly. The +15V from Q14 charges C4 through R15, turning on Delay 4 transistor Q13 30 msec after t_3.

At this time (t_4), the signal from Q13 turns Q8 on again, which then turns off FET 1 Switch Driver Q16. This then turns FET 1 Switch Q19 off again. At the same time FET 2 Switch Driver Q12 is also turned on, and +15V is applied to FET 2 Switch Q23, turning it on. The ERROR AMPL signal is now routed to the YTO Tickler Coil Predriver, where it controls the YTO frequency. The +15V from Q12 charges C5 through R28, turning on Delay 5 transistor Q11 40 msec after t_4.

At this time (t_5), Q10 is turned back on, which turns off Zero Span Driver Q9. The ZERO line no longer has +15V applied to it by Q9, and the sweep is turned back on (unless the front-panel ZERO SPAN mode pushbutton is depressed). The analyzer is now in the stabilized mode.

Error Amplifier B

The input to the Error Amplifier is the ERROR signal from the Discriminator in the Tuning Stabilizer Assembly. Op amp U5 is connected as an inverting amplifier with a gain of 3.16 at dc and low frequencies. R38 and C7 roll off the gain at higher frequencies to compensate the frequency response of the stabilizer lock loop. The ERROR signal is nominally at 0 Vdc immediately after the YTO is stabilized. There is some ac signal present, corresponding to the FM which is being eliminated at the YTO. The ERROR signal has a sensitivity of +0.46V per MHz of correction for the fundamental of the YTO. This sensitivity is divided by the harmonic number N for the higher frequency bands, which use harmonic mixing. When the analyzer is not in the stabilized mode, and also at the time interval t_3 to t_4 during the stabilization process, FET 1 Switch Q19 is turned on, shorting the ERROR signal to ground.

Sample and Hold D

This circuit samples and holds the ERROR AMPL signal, which was required to move the VCXO harmonic lock point to the YTO frequency. With the reed relay K1 closed, the ERROR AMPL signal from the output of the Error Amplifier is applied to the storage capacitor C11. At time t_2 during the stabilization process, K1 is opened and remains open unless the AUTO STABILIZER is turned off and back on again. C11 has a very high leakage resistance, and Q20 is a MOSFET with a very high input resistance. This means that the voltage on C11 will be maintained with little change for a long time. Q20 is connected as a source follower to monitor the voltage on the storage capacitor C11. Q21 is used to bias Q20 such that the source to drain voltage is maintained nearly constant regardless of variations in output voltage at TP12. The output of this stage goes to the VCXO Sweep Driver.

VCXO Sweep Inverter E

This stage inverts the TICK S+T signal from the Tickler Sweep + Tune Summer so it is the correct polarity for input to the VCXO Sweep Driver. Op amp U8 is connected as an inverting amplifier with an inverted gain of 1.62.

VCXO Sweep Driver H

The VCXO SWP output from this stage goes to the 2/F potentiometer which is ganged to the coarse TUNING potentiometer at the front panel. The 2/F VCXO SWP signal goes to the VCXO Sweep Buffer. The output of the VCXO Sweep Buffer, .4/F VCXO SWP, goes to the VCXO Sweep Varactor Driver in the Tuning Stabilizer Assembly. The VCXO Sweep Driver has two

TIMING SUMMARY

t_0	The stabilization process is initiated by changing the analyzer controls from unstabilized to stabilized settings. The VCXO Pulse Amplifier is turned on and the sweep is shut off by activation of the ZERO line.
t_1	FET 1 Switch, which has been on, shorting the ERROR signal to ground, is turned off. The ERROR AMPL signal is allowed to pass through the closed contacts of K1, through the Sample and Hold circuit, VCXO Sweep Driver, and VCXO Sweep Buffer to the VCXO. This signal causes the VCXO to shift frequency to move a harmonic lock point to the YTO frequency.
t_2	Relay K1 opens leaving the ERROR AMPL signal, which was present just before time t_2, stored on the capacitor C11.
t_3	FET 1 Switch is turned on again to discharge A36A1C17 at the output of the Discriminator and C7 in the Error Amplifier.
t_4	FET 1 Switch is again turned off and FET 2 Switch is turned on, routing the ERROR AMPL signal to the Tickler Coil Predriver, where it controls the YTO frequency.
t_5	The ZERO line is turned off causing the sweep to be resumed. The stabilization process is now completed with the analyzer in the stabilized mode.

Figure 8-37. Control Generator Timing Diagram (1 of 2)

A19 YIG Driver Assembly SERVICE SHEET 14

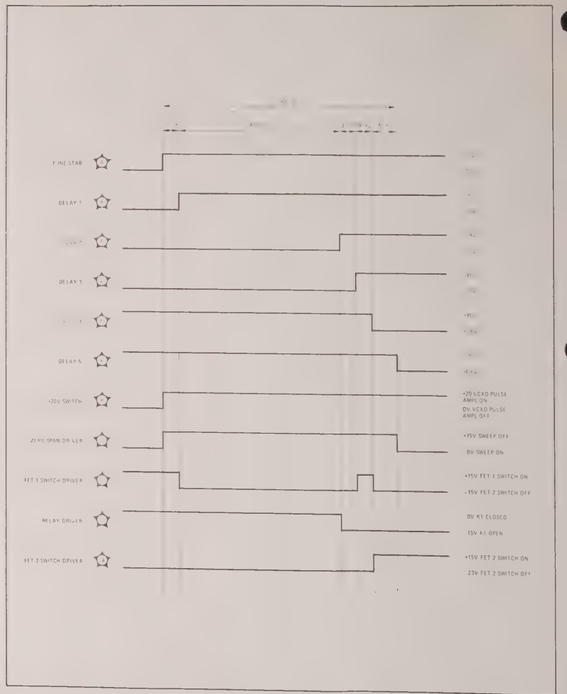

Figure 8-37. Control Generator Timing Diagram (2 of 2)

inputs. One input is the voltage from the Sample and Hold circuit, which holds the voltage which was required to move the VCXO harmonic lock point to the YTO frequency. The other input, from the VCXO Sweep Inverter, is an inverted and amplified version of the TICK S+T signal at the output of the Tickler Sweep + Tune Summer. This signal provides the FINE tuning and sweep for the stabilized mode, for if the TICK S + T signal were applied only to the Tickler Coil Driver, the stabilization loop would hold the frequency constant. In stabilized operation the TICK S + T signal is still applied to the Tickler Coil Driver, so that the ERROR voltage does not need to provide the FINE tune and sweep ramp.

The FET OFFSET potentiometer R68 is adjusted to compensate for the offset introduced by FET Q20. R64 and C14, with R65, provide frequency compensation for the lock loop during the interval from t_1 to t_2 of the stabilization process, when the VCXO is momentarily locked to the YTO. Op amp U1 is connected as an inverting amplifier. It has a nominal inverted unity gain for the Sample and Hold output signal and a nominal inverted gain of 5.1 for the output of the VCXO Sweep Inverter. The VCXO SWP potentiometer R71 is adjusted to provide the proper frequency spans in stabilized operation.

VCXO Sweep Buffer (K)

The input to this stage (2/F VCXO SWP) comes from the 2/F potentiometer ganged with the coarse TUNING potentiometer at the front panel. The resistance put in this line by the 2/F potentiometer increases as the YTO frequency is increased. For a higher YTO frequency, the YTO is locked to a higher harmonic of the 1 MHz VCXO. This potentiometer, with R74 and R73, attenuates the signal applied to the VCXO such that a given VCXO SWP voltage causes the same movement of the VCXO harmonic to which the YTO is locked, regardless of its harmonic number. For FREQUENCY BAND GHz .01 – 1.8, the B1 line is activated (+15V) and Q22 is turned off so that R73 does not shunt R74. This gives less attenuation range to the 2/F potentiometer, which is necessary for this band as the coarse TUNING control has less YTO tuning range. For the harmonic mixing bands, this sensitivity is divided by the harmonic number N.

TUNING STABILIZER SYSTEM, CIRCUIT DESCRIPTION

A14 Tuning Stabilizer Control Assembly (Service Sheet 15) and A36 Tuning Stabilizer Assembly (Service Sheet 16) are closely related and together form the Tuning Stabilizer System.

The Tuning Stabilizer system locks the first local oscillator (LO), which is a YIG-Tuned Oscillator (YTO), to a harmonic of a 1 MHz crystal oscillator to reduce the residual FM of the first LO. Stabilized operation is permitted for narrow frequency spans (1 kHz/DIV to 100 kHz/DIV) and for ZERO SPAN mode.

Figure 8-38 is a simplified block diagram of the Tuning Stabilizer System. The lock loop can be considered as an IF-type Automatic Frequency Control (AFC) system. The sampler functions as a mixer with the first LO signal as one input and the harmonic of the 1 MHz oscillator as the other input. The 2460 harmonics betweeen 2.0 and 4.46 GHz are mixed with the first LO signal in the Sampler. The Sampler output contains the sum and difference frequencies of the two inputs. The output is filtered by a 500 kHz low-pass filter, so only the difference between the LO signal and the nearest 1 MHz harmonic need be considered. The first LO signal can never be more than 500 kHz away from one of the harmonic pulses, so there will always be an output from the filter. The output from the filter is applied to a Discriminator that produces an output voltage related to frequency. (See the Discriminator block in Figure 8-38.)

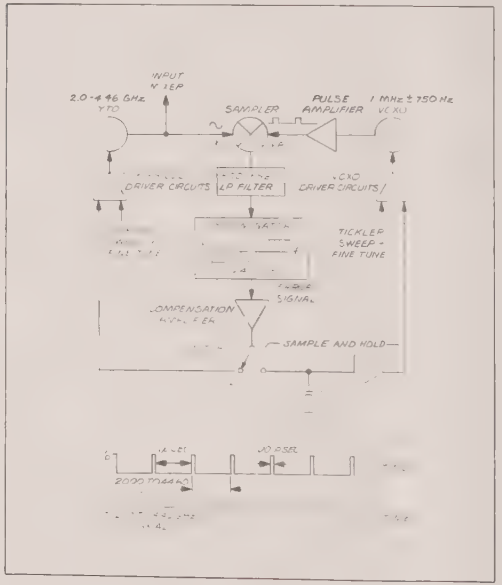

Figure 8-38. Tuning Stabilizer System, Simplified Block Diagram

The error signal from the Discriminator is fed through a Compensation Amplifier and combined with the Tickler Sweep + Fine Tune signal. This signal is then applied to the YTO, causing the frequency to change to produce a near-zero ERROR signal. This

(Continued on next Page)

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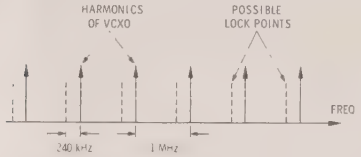
means that the YTO frequency will differ from a 1 MHz harmonic by approximately 240 kHz, as shown below:



The frequency is approximate because this is an AFC system with a finite loop gain of 1000. When lock is accomplished, if the YTO has to move 100 kHz to get to a lock point, the Discriminator has to provide an ERROR voltage to do this; and the difference frequency will differ from 240 kHz by 100 Hz.

To achieve initial lock, the YTO is not actually moved to a lock point. Instead, a lock point is brought to the YTO frequency to avoid a center frequency shift in the display when the Tuning Stabilizer System is actuated. This is accomplished by initially reversing the AFC roles of the 1 MHz VCXO and the YTO. The ERROR signal is initially fed back to the frequency control circuitry of the 1 MHz Voltage Controlled Crystal Oscillator (VCXO), switch position 1. The frequency of the VCXO is shifted to bring a lock point to the YTO. In this connection, the YTO rather than the VCXO is functioning as the reference. After a fixed time, the ERROR signal is switched from the VCXO to the YTO (switch position 2), locking the YTO to a stable VCXO. The ERROR signal that moved a lock point to the YTO frequency is stored on a capacitor in the Sample and Hold Circuit.

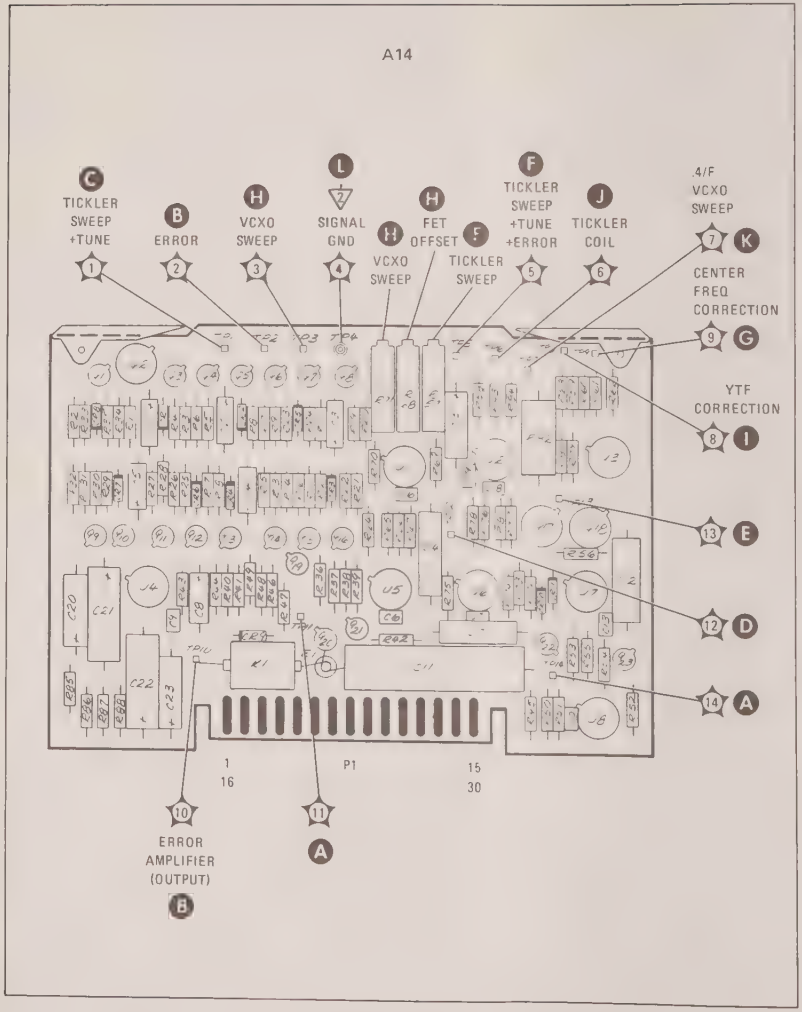
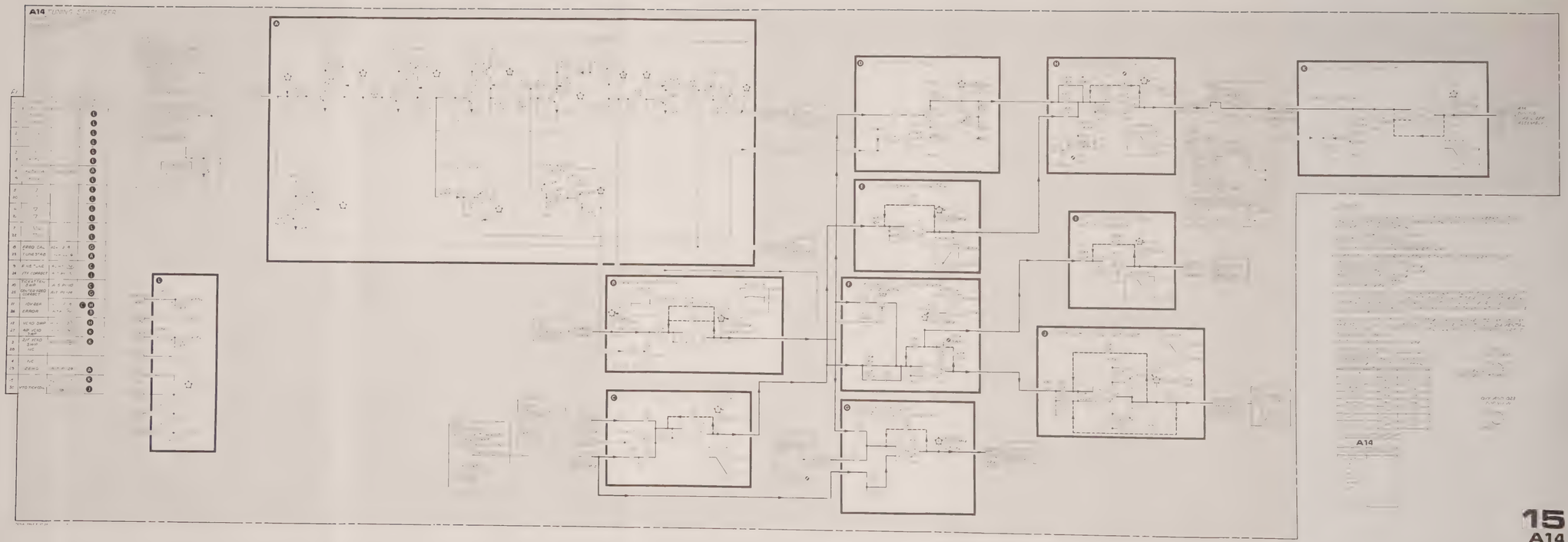


Figure 8-39. A14 Tuning Stabilizer Control Assembly, Component Locations



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A14

Figure 8-40. A14 Tuning Stabilizer Control Assembly, Schematic Diagram

SERVICE SHEET 16
A36 TUNING STABILIZER ASSEMBLY

The Tuning Stabilizer Assembly is used only in the AUTO STABILIZER mode, where the YTO (the first LO) is locked to the 1 MHz Voltage-Controlled Crystal Oscillator (VCXO). This assembly comprises three subassemblies: A36A1 Discriminator Assembly, A36A2 VCXO Assembly, and A36A3 Sampler Assembly. Additional control circuitry for the tuning stabilizer operation is in the Tuning Stabilizer Control Assembly.

A36A2 VCXO Assembly

Voltage Controlled Crystal Oscillator (VCXO) (A)

The Voltage-Controlled Crystal Oscillator (VCXO) is the 1 MHz reference for the tuning stabilizer circuit. The 1 MHz oscillator is electronically tunable ±750 Hz. The VCXO consists of a high-Q Fixed-Frequency Crystal Filter, a Limiting Amplifier, a low-Q LC Variable Frequency Filter, and a Phase-Splitter circuit. The oscillator will oscillate at a frequency such that the phase shift through the two filters is zero. If the Variable Frequency Filter is set by voltage on the varactor diodes to 1 MHz, the phase shift through each filter will be zero and the sum will be zero. If the frequency of the Variable Frequency Filter is set to a frequency different from 1 MHz, the frequency of oscillation will shift such that the phase shift through the Crystal Filter is equal in magnitude, but opposite in sign, to the phase shift through the Variable Frequency Filter. By changing the bias voltage on the varactor diodes A2CR1 through A2CR4, the oscillation frequency is changed. Since the Q of the Crystal Filter is much greater than the Q of the LC Filter, the frequency stability is on the order of the crystal stability.

The VCXO is tunable over ±750 Hz. This whole tuning range is used only at the low end of the 1.7 — 4.1 GHz band. Approximately ±250 Hz of this range is for moving the VCXO to the lock point as determined by the voltage output from the sample and hold circuit. Depending on how close the YTO frequency is to one of the 1 MHz harmonic lock points, the VCXO will move from 0 to ±250 Hz when stabilized operation is initiated. The FINE tuning control has a range of approximately ±250 Hz, which corresponds to ±0.5 MHz at the YTO. The amount the VCXO is tuned to achieve lock and for FINE tuning decreases as the YTO frequency is increased. The sweep ramp for a FREQUENCY SPAN/DIV of 100 kHz has a range of ±250 Hz. The amount the VCXO is swept for ramp a given frequency span is decreased as the YTO frequency is increased; it is also decreased as harmonic number N for the higher bands, where harmonic mixing is used.

An accurate way to measure the VCXO frequency is with the VCXO cover installed. A2TP1 can be accessed through a hole in the cover. An oscilloscope probe that has less than 20 pF capacitance should be used. The frequency thus measured should be 1 MHz ± 1 kHz, with peak-to-peak amplitude of 5V to 9V. This scope probe should also be used to measure the signal at A2TP3.

There are four adjustable components in the VCXO circuit (see Tuning Stabilizer Adjustments in Section V). A2C16, 1 MHz PEAK, adjusts the center frequency of the Variable Frequency Filter. A2C2, 1.3 MHz NULL, is adjusted to balance out the capacitance of the crystal holder for A2Y1. A2C3, LINEARITY, adjusts the VCXO circuit to provide a linear frequency change with a linear change in bias voltage to varactor diodes A2CR1 through A2CR4. A2R27, 1 MHz GAIN, is a factory adjustment only. Do not adjust components unless necessary (see Section V).

A2Q2 and A2Q3 may be checked by applying a signal at A2TP1 and observing the output at A2TP3. Disconnect one end of A2C4 and connect a 1 MHz signal from A2TP1 to ground. The voltage at A2TP3 should peak between 4V and 9V when the frequency is varied around 1 MHz. The signal at the emitters of A2Q2 and A2Q3 should be a half-wave rectified sine wave with a positive peak of 2.4 ±0.5V and with the negative portion clipped at −0.6 ± 0.15V.

Quartz crystal A2Y1 can be checked for proper operation using the same test setup as for A2Q2 and A2Q3 above. Connect the oscilloscope to the source of FET A2Q4 and tune the 1 MHz signal source around 1 MHz. The 1 MHz sine wave at the source of A2Q4 should peak at 1 MHz.

VCXO Sweep Varactor Driver (B) Bias voltage for varactor diodes A2CR1 throug A2CR4 is supplied by op amp A2U1. The input to A2U1 is the .4/F VCXO SWP from the Tuning Stabilizer Control Assembly. This signal is an attenuated combination of the TICK ATTEN SWP and FINE TUNE signals and the output of the Sample and Hold circuit in the Tuning Stabilizer Control Assembly. This signal has been attenuated by an amount depending on the YTO frequency. When the analyzer is tuned to the low end of a band, the YTO frequency is near 2.05 GHz. With the YTO at 2.05 GHz, when locked to the 2050th VCXO harmonic, a frequency shift of 1 Hz at the VCXO will cause a shift of 2050 Hz at the YTO. When the analyzer is tuned to the high end of a band, the YTO frequency is near 4.40 GHz. With the YTO at 4.40 GHz, when locked to the 4400th VCXO harmonic, a frequency shift of 1 Hz a the VCXO will cause a shift of 4400 Hz at the YTO. To correct for the change in frequency shift as the YTO is tuned toward the high end of its range, the input signal to the VCXO must be attenuated.

The nominal tuning sensitivity on the .4/F VCXO line is −300 Hz/V for the 1 MHz fundamental. The nominal tuning sensitivity referred to the YTO frequency is −3.3V/MHz, divided by the YTO frequency in GHz. These sensitivities are for fundamental mixing in the First Mixer Assembly. For the harmonic mixing bands, these sensitivities are divided by the harmonic number N. The .4/F VCXO SWP is summed with an offset voltage at the negative input of A2U1. A2U1 has an inverted gain of 1.04 for the .4/F VCXO SWP signal. THERMISTOR A2RT1 varies the offset as a function of temperature to compensate for the temperature dependence of the varactors A2CR1 through A2CR4.

Pulse Amplifier (C) The Pulse Amplifier converts the 1 MHz signal (±750 Hz) from the VCXO to a square wave pulse of sufficient amplitude to drive the mixer diode in the Sampler Assembly. The positive portion of the 1 MHz sine wave from the VCXO turns on A2Q5. The output of A2Q5 goes from +20V when it is turned off to near 0V when it is on. The +20VF2 voltage is switched off, disabling the Pulse Amplifier, when the analyzer is not in the AUTO STABILIZER mode. A2R23, A2R24, and A2CR9 provide for the same power dissipation whether +20 VF2 is off or on; this minimizes VCXO drift when the stabilizer is turned on after a period of analyzer operation with the stabilizer off. The pulse from A2Q5 is capacitively coupled to A2Q6, where it is inverted, giving an output at the collector of A2Q6 of −10V when off to near 0V when on. This signal is coupled into the Step Recovery Diode Driver A2Q7, whose output (TPD) is approximately a square wave of 1 MHz going from −10V when on to +0.7V when off. The positive portion of the output pulse is clamped at this level by the sampler diode (not shown) in the Sampler Assembly.

A36A3 Sampler Assembly

Sampler (D) The Sampler mixes the 2.00 to 4.46 GHz signal from the YTO first LO with the harmonics from the 1 MHz VCXO and produces sum and difference output signals for the Discriminator Assembly. The YTO signal is routed through the First Mixer Assembly and a 2.0 to 4.5 GHz isolator AT2 before being applied to the Sampler. The YTO signal fed through the Sampler is terminated in a 50-ohm load at the rear-panel 1ST LO OUTPUT. The 1 MHz square wave from theVCXO Pulse Amplifier drives a step recovery diode in a differentiator circuit to produce a train of very narrow pulses. The frequency spectrum of the 1 MHz pulse train is a series of 1 MHz harmonics extending through 4.5 GHz. The Sampler mixes the 2460 harmonics between 2.00 and 4.46 GHz with the 2.00 to 4.46 GHz YTO signal. The output is amplified, then filtered through a 500 kHz Lowpass Filter and applied to a 240 kHz Discriminator. The output of the Discriminator is fed back as the ERROR signal to the Tuning Stabilizer Control Assembly, locking the YTO frequency to a harmonic from the VCXO. Immediately after the YTO is stabilized, the output from the Discriminator is 0V and the YTO frequency is offset from the nearest VCXO harmonic by approximatley 240 kHz.
To check the Sampler, do the following with the Analyzer in the stabilized mode: Observe voltage at TPD with an oscilloscope. The signal should be a 1 MHz square wave between −10 ± 1V and +0.7 ± 0.2V with a frequency of 1 MHz ± 10 kHz. If the waveform at TPD has an upper limit approaching +20V, check for an open A2W1 Cable or open Sampler Assembly step recovery diode. The sampler diode may be checked by inserting a wire in the pulse input connector J3 and checking the diode with an ohmmeter. Using an HP 412A Volt-Ohm-Ammeter, on the 100-ohm range, the diode should indicate 100 to 500 ohms with the positive probe to the center conductor and the negative probe to ground. The ohmmeter should indicate greater than 1 megohm in the reverse direction.

NOTE

Other ohmmeters may give different resistance measurements. The actual value depends on the voltage of the ohmmeter.

If the voltage at TPD is zero, check for a shorted cable or a shorted Sampler Assembly step recovery diode by the above test.

A36A1 Discriminator Assembly

Tuning Stabilizer Preamplifier (E) The Sampler Assembly output is amplified in the Tuning Stabilizer Preamplifier before it is applied to the 500 kHz Lowpass Filter. The Sampler output signal at TPA is a +1.8V to +2.4V dc level with the various output signals from the Sampler Assembly superimposed on the dc signal. A1Q1 and A1Q2 are connected as a FET-input cascode stage which has a high input impedance. A1Q3 is a common emitter output stage.

+5V Regulator (F) This circuit has a +10V input and a +5V output. A1CR3 puts +5.6V on the base of A1Q10, which in an emitter-follower configuration has a +5V output at its emitter.

500 kHz Low Pass Filter (G) This is a 500 kHz Chebychef low pass filter. The filter rejects the 1 MHz sampling signal and the unwanted sideband from the Sampler Assembly. The output at TPB is approximately −1 Vdc with a 0.25V peak-to-peak 240 kHz sine wave.

Emitter Follower Buffer Amplifier (H) A1Q4 and A1Q5 are emitter followers connected to terminate the 500 kHz low pass filter in 1000 ohms and to provide a low output impedance to drive the Fixed Phase Differential Comparator and the Variable Phase Differential Comparator.

Fixed Phase Differential Comparator (I) **and Variable Phase Differential Comparator** (J) A1L4, A1C11, and A1C12* form a series resonant circuit whose Q is determined primarily by A1R14* and the resistance of A1L4. The values of A1C12* and A1R14* are factory selected to set the frequency and Q of the 240 kHz resonant circuit.

A1U1 is a transistor array consisting of five identical transistors in a 14-pin integrated circuit package. Four of the transistors in A1U1 combined with A1Q6 and A1Q7 make up two independent differential comparators. The differential comparators convert the sine wave input into a square wave output. The phase difference between the two square waves is a function of the input frequency. The outputs are nearly in phase at low frequencies, 90 degrees out of phase at 240 kHz, and nearly out of phase at 500 kHz. These outputs go into an EXCLUSIVE OR circuit (see Figures 8-41 and 8-42).

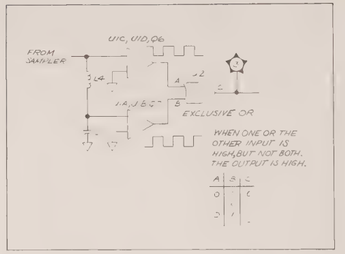

Figure 8-41. 240 kHz Discriminator, Simplified Schematic

EXCLUSIVE OR (K) A1U2 is a quadruple NAND gate integrated circuit connected as an EXCLUSIVE OR circuit. Its output is high when the two inputs are different, and low when they are the same. The output of the EXCLUSIVE OR circuit at A1TP3 has a dc component with an average value that is a function of frequency (see Figure 8-42).

Pulse Width Controlled Voltage Generator (L) The output of the EXCLUSIVE OR circuit is applied through A1Q9, A1Q8, and associated circuitry where the signal is buffered, offset, and filtered. Q9 and Q8 are connected as a dc-coupled differential amplifier. The error output signal is a dc voltage related to frequency as indicated in Figure 8.43. Immediately after the YTO (first LO) is stabilized, the ERROR signal will be approximately 0 Vdc. Now if the YTO is increased in frequency because of drift or noise, the ERROR signal will go negative and bring the YTO back to very nearly the same frequency. If the YTO is decreased in frequency, the ERROR signal will go positive. Slightly tuning the coarse TUNING control will have the same effect. R30 and C17 constitute a low pass filter.

DISCRIMINATOR ASSEMBLY TESTING

The operation of the Discriminator Assembly can be tested as follows:

Disconnect 958 wire (ERROR out) from C4. Set AUTO STABILIZER switch OFF.

Connect a 13 mV peak-to-peak signal at a frequency of 10 to 700 kHz from TPA to chassis ground. (It is not necessary to disconnect the Sampler Assembly.)

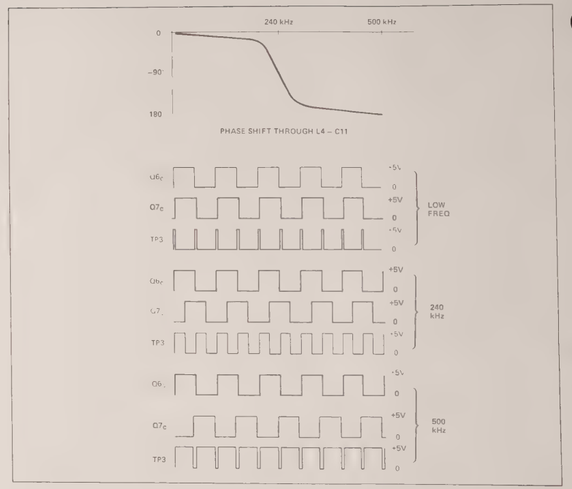

Figure 8-42. Discriminator Wave Shapes

Vary the frequency of the oscillator while observing the discriminator ERROR output at C4. The discriminator output should vary as shown in Figure 8-43. If the correct output is not obtained, perform the following tests with the oscillator still connected to TPA.

The signal at A1TP1 should be a sine wave, 0.15V to 0.3V peak-to-peak, for frequencies between 1 and 500 kHz. The voltage level should decrease rapidly as the frequency is increased above 500 kHz. Observe signals at collectors of A1Q6 and A1Q7 with a dual-channel oscilloscope. The signals should be 0 to +5V square waves. As the oscillator frequency is varied, the phase relationship of the square waves should vary as follows: At low frequency, the square waves should be almost in phase; at 240 kHz they should be approximately 90 degrees out of phase; at frequencies ap-

proaching 500 kHz they should be nearly 180 degrees out of phase. Also note how the average value of the EXCLUSIVE OR output at A1TP3 increases as the oscillator frequency is increased (see Figure 8-42).

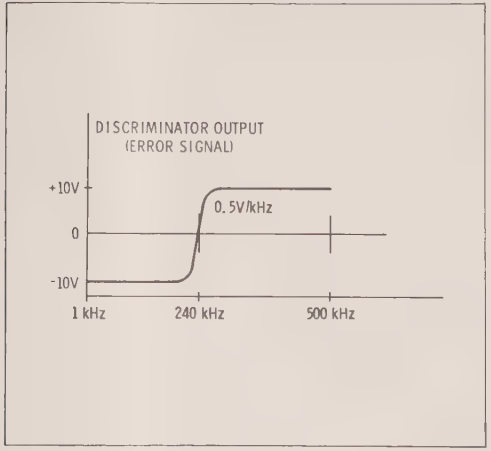

Figure 8-43. Discriminator Output ERROR Signal

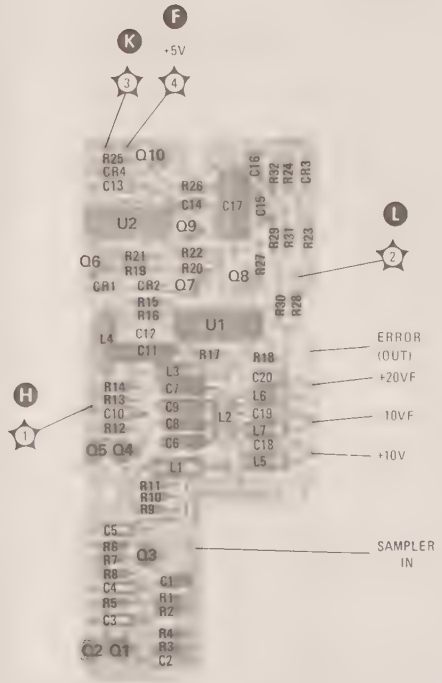

Figure 8-44. A36A1 Discriminator Assembly, Component Locations

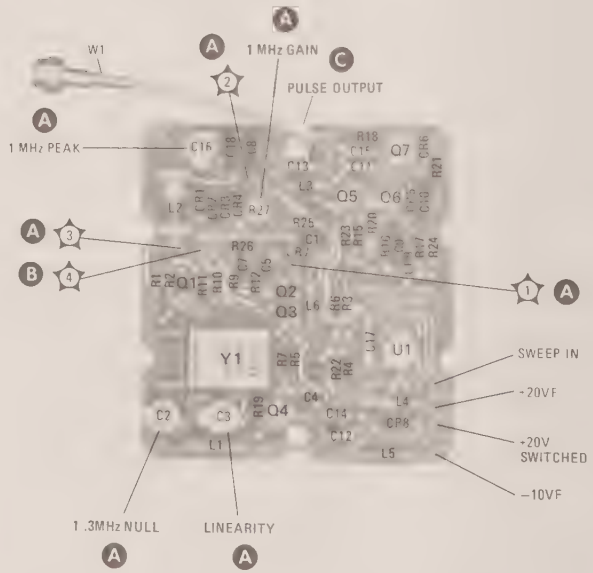

Figure 8-45. A36A2 VCXO Assembly, Component Locations

Figure 8-46. A36 Tuning Stabilizer Assembly, Schematic Diagram

SERVICE SHEET 17

A12 DVM ANALOG ASSEMBLY, CIRCUIT DESCRIPTION

Figures 8-47 and 8-48 show a block diagram, a simplified timing diagram, and an overall timing diagram for the Digital Voltmeter (DVM). The basic measurement technique is to apply the input voltage to an integrator for a fixed time, charging the integrating capacitor. Then the integrator is given a known voltage of the opposite polarity to discharge the integrating capacitor. The time it takes to discharge the capacitor is proportional to the input voltage and is measured with a precise digital counter. If the magnitude of the input voltage equals the reference voltage, the discharge time will equal the fixed, known charging time.

The designations T_1, T_2, etc., in the timing diagram refer to time intervals, not points in time.

In the block diagram (Figure 8-47), the CENTER FREQ, −REF V, and +REF V (not shown on the schematic) voltages are always present at the inputs to their respective switches. (In the timing diagram, the CENTER FREQ voltage is 12.000V, corresponding to a reading of 12.000 GHz.) At the beginning of T_1, the Input Switch is closed and the CENTER FREQ voltage is applied to the Input Amplifier. During T_1, the Input Amplifier settles so that a stable voltage will be presented to the Integrator Switch. At the beginning of T_2, the Integrator NORM Switch closes, and the integrating capacitor is allowed to charge until the end of T_2, at which time the Input Switch and Integrator Switch are opened and the −REF V Switch closed. During T_3, the Input Amplifier is again allowed to settle. At the beginning of T_4, the Integrator Switch is again closed, commencing the discharge of the Integrator capacitor. The switch remains closed until the Integrator output reaches 0V. This will happen very quickly for input levels near 0V but will extend into the early part of T_6 for the maximum level corresponding to 22 GHz. After this zero crossing occurs, the Auto Zero function is initiated by the closing of the Auto Zero Switch, the Auto Zero Sampler Switch, and the FAST integrator switch. During the Auto Zero time the offset error in the system is placed on the Auto Zero capacitor. At the end of T_6 (beginning of T_1) the Auto Zero function is terminated, but the offset error remains on the Auto Zero capacitor for the duration of the measurement cycle.

The generation of timing signals for the switches and the measurement of the discharge time interval are performed by the digital timing and control circuits in the DVM Digital Assembly.

Input Switch (A)

The CENTER FREQ voltage present at the input to the Input Switch is divided by ten by the voltage divider R1, R2 to yield a voltage that has a scale factor of 10.000 GHz per volt. This voltage is transferred to the Input Amplifier during T_1 and T_3 by the FET switch Q11. During T_1 and T_3 a TTL low on the INPUT ENABLE line turns on the switch driver Q14 and CR1 is then back-biased. The gate of Q11 is held at the input level, since R7 is tied to a feedback divider R39, R40, which in turn is tied to the output of the Input Amplifier. During T_3 through T_6, the INPUT ENABLE goes high, turning off Q14, which causes CR1 to conduct, turning Q11 off.

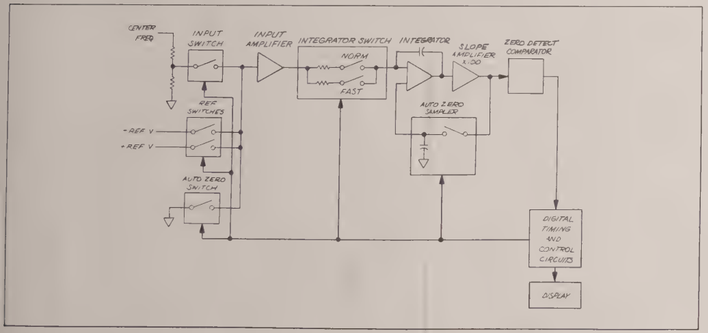

Figure 8-47. DVM Block Diagram

Reference Switches (B)

The operation of the Reference Switches is similar to that of the Input Switch. If the CENTER FREQ voltage is positive, the digital control circuits will cause the negative reference switch to conduct; if the input is negative, the positive reference switch will conduct. In both cases the switches will conduct from the beginning of T_3 until the integrator passes through zero. Since negative input voltages need not be measured accurately, the positive 1.0V reference is simply derived from a voltage divider off the +5V supply. The positive input voltage must be very precisely measured; therefore, the −1.0V reference is derived from an external −10V reference supply. R1S through R22 divide the −10V down to −1.0V and allow for a small adjustment around −1.0V.

Auto Zero Switch (C)

This switch is similar to the other switches except that it is simplified by the fact that it must switch only a 0V level. It is turned on by the digital control circuits after the Integrator has reached 0V output. This can occur during T_4, T_5, or the first part of T_6. It is turned off at the end of T_6 regardless of when it was turned on.

Input Amplifier (E)

The Input Amplifier is a high input impedance, dc amplifier with a voltage gain of approximately 3.5. The current from the dual-input FET Q9 is supplied by current source Q8 and is balanced by R37. The output of the amplifier supplies the signal to the Integrator Switch circuit; it also supplies the feedback voltage for the Input and Reference FET switches. The gain of this amplifier need not be precisely set, since only the ratio of the input and reference voltages must be preserved; not their actual levels.

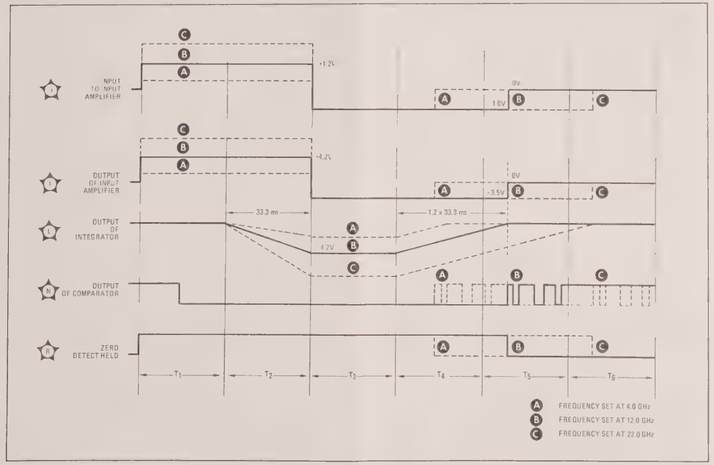

Figure 8-48. DVM Analog Assembly, Simplified Timing Diagram

Integrator Switch (F)

There are two FET switches in the Integrator Switch circuit. The "normal" switch Q3 is used during the normal measurement cycle, while the "fast" switch Q4 is used to speed up the response of the Auto Zero cycle. Since the Integrator resistors R30 and R31 are placed before the switches, the switches need only pass signals very near ground level, simplifying the switch drivers. Logic gates U6B, U6C, and U7D act as a decoder to turn on the "normal" switch Q3 during T_2, and the discharge period of the integrator. The "fast" switch Q4 uses the same driver as the Auto Zero Switch and is on from the time the integrator crosses zero until the end of T_6.

Integrator (G)

The Integrator consists of a dual-FET input stage Q5, an op amp U2, and the integrating capacitor C9. The charging current for C9 is equal to the current into the integrator, which is determined by the output of the Input Amplifier and either resistor R30 or R31. The non-inverting input to the integrator is not grounded, as would be expected, but instead is tied to the error voltage stored on the Auto Zero capacitor C21.

Slope Amplifier X100 (I)

The Slope Amplifier X100 circuit consists of two stages (U3 and U4), each having a gain of 10. The U3 output must be free of noise and thus has heavy power-supply filtering (L1, L2, and C15). The U4 output is clamped to ±1.2V by diodes CR7 through CR10 so that it will recover rapidly from an overload. The output of the Slope Amplifier X100 circuit will change only when the integrator output is near 0V; otherwise it will be clamped to ±1.2V.

Zero Detect Comparator (J)

The Zero Detect Comparator is a high-speed voltage comparator that has an output compatible with TTL logic. In order to accommodate small system offsets, the exact voltage level that will cause a transition of the output is adjusted with the ZERO ADJ potentiometer R56. The HYST adjustment R53 feeds a portion of the input amplifier output to the comparator. It is made necessary by the fact that the integrating capacitor has dielectric absorption. To eliminate this effect the discharge time measurement is actually started 42 μsec after the beginning of T_4. (This is done by the Delay Timer circuit in the DVM Digital Assembly.) To compensate for this delay, a portion of the reference voltage present at the time of the discharge zero crossing is applied to the comparator through resistors R52, R53, and R55. The level is adjusted by R53.

Zero Detect Gates (K)

The Zero Detect Gates cause either polarity of zero crossing of the integrator to generate the same polarity logic transition, and they ensure that only the discharge zero crossing is recognized by the following logic. The POL line (U6A pin 1) from the DVM Digital Assembly indicates which reference polarity was used for the present measurement cycle. (A low indicates that +REF V was used, and vice versa.) This signal, in conjunction with the comparator output, causes the output of U6A to always have a low-to-high transition for the discharge zero crossing. U9B inverts the discharge transition and causes the opposite transition to always occur at the beginning of T_1.

The TEST-NORM switch is a troubleshooting aid. The TEST position simulates a zero crossing at the beginning of T_5 to generate a normal sequence of logic levels to the FET switch drivers. This will be recognized by the logic circuitry as −10.000 on the FREQUENCY GHz readout.

Zero Detect Catcher (L)

Since the reference voltage is removed when the discharge zero crossing occurs, the output of the comparator may oscillate following the first transition. The Zero Detect Catcher latches after the initial high-low transition. The latch is reset at the beginning of T_1 and remains high until the next valid discharge zero crossing.

State Counter (D)

The State Counter consists of three D flip-flops which generate signals HA, HB, and HC. Signal HA is used to generate signal HB, and signal HB is used to generate signal HC. The inverse of signal HC (i.e., LC) is then used to produce a signal HA (via gates U7C and U9C). The various combinations of signals HA, HB, and HC determine the "state code" of the instrument timing. State codes 101 and 010 are illegal and will be entered only if caused to do so by transient pulses during initial turn-on. If an illegal state is entered, the flip-flops will be cleared on the next reset pulse. This sets the counter to state 000, at which time an Auto Zero cycle occurs. The timing sequence then continues in its normal fashion.

Display Ramp Generator Transition Gate (M)

This gate is functionally part of the DVM Digital Assembly, although it is physically located on the A12 board. Refer to circuit description of Drive Current Ramp Generator (P) on Service Sheet 18.

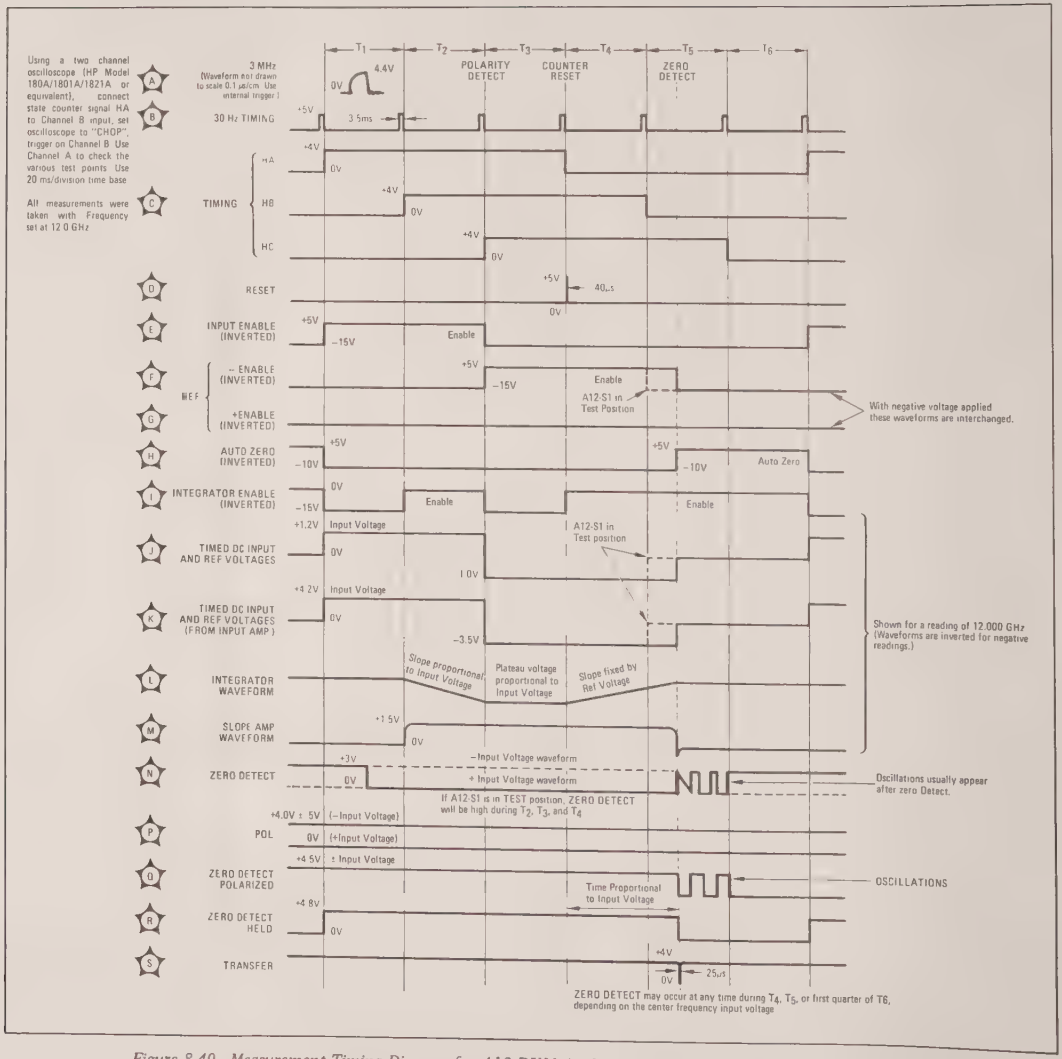

Figure 8-49. Measurement Timing Diagram for A12 DVM Analog Assembly and A11 DVM Digital Assembly

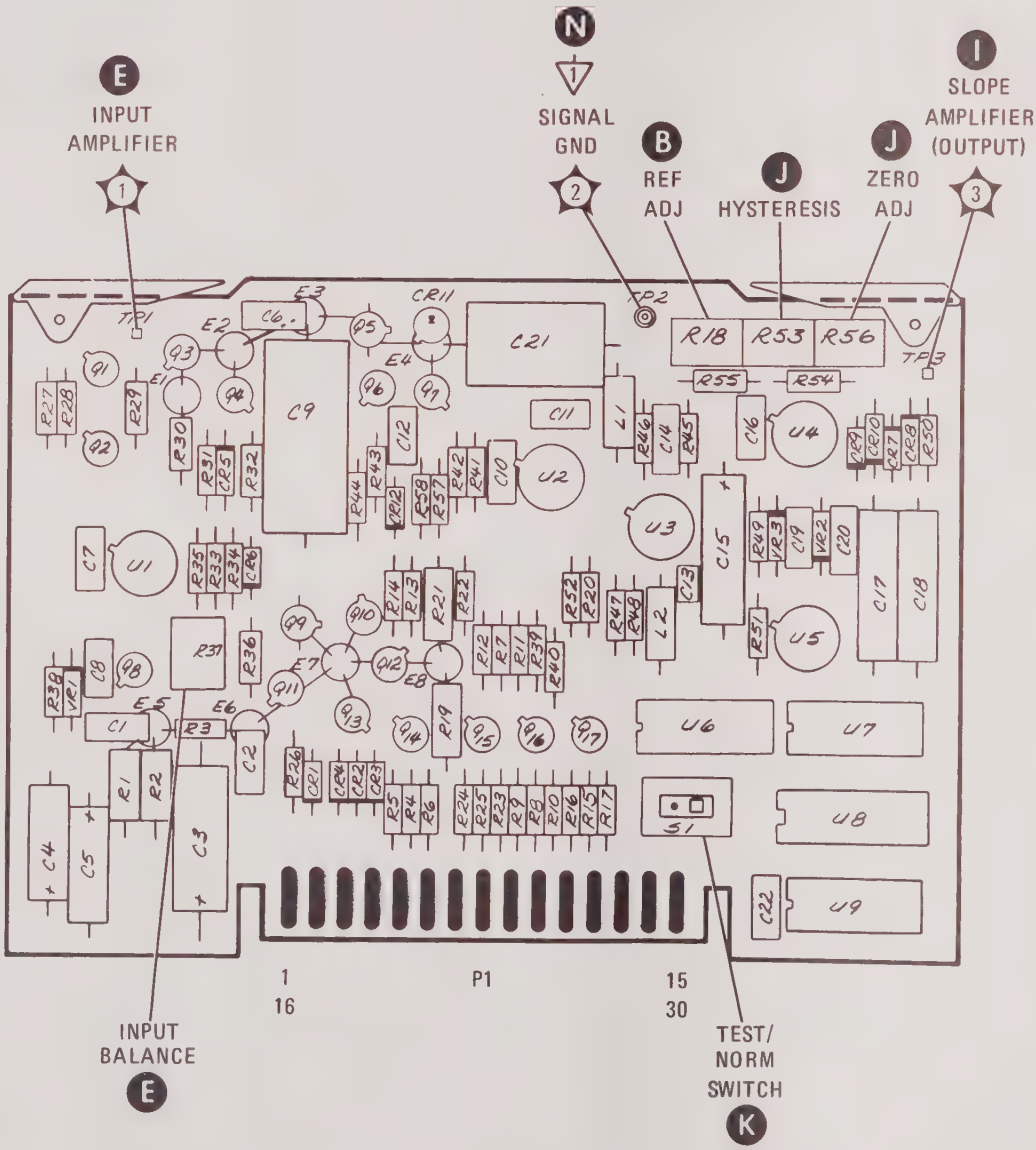

Figure 8-50. A12 DVM Analog Assembly, Component Locations

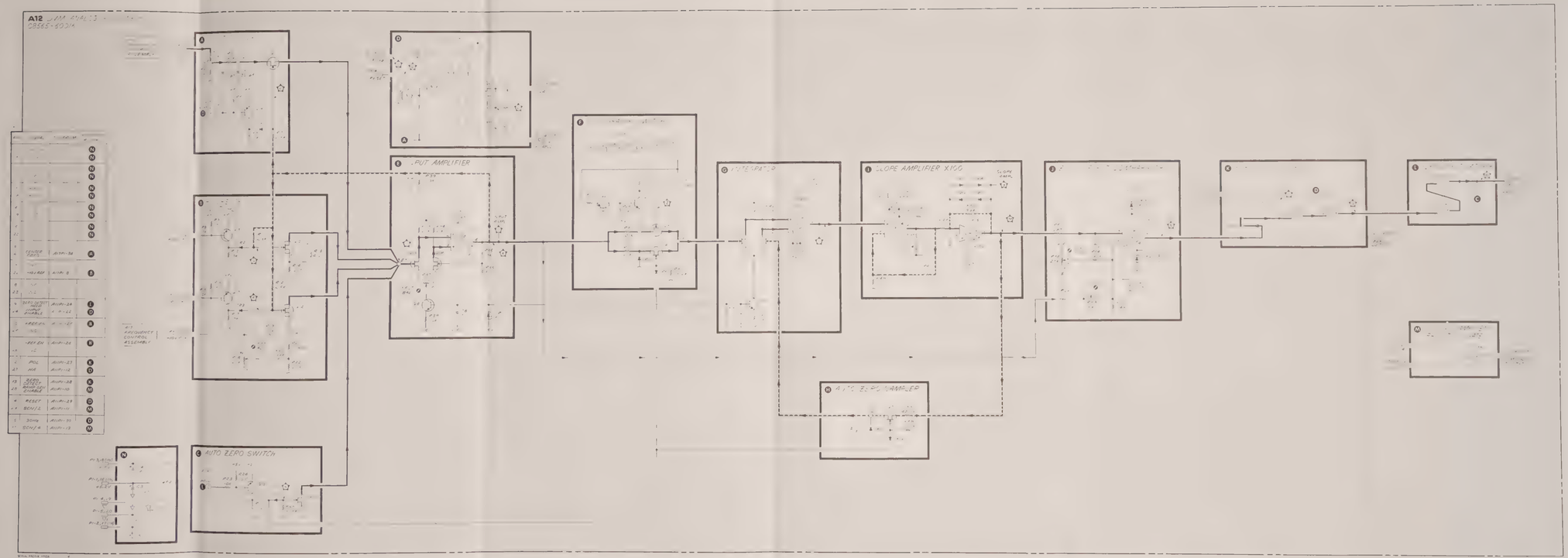

Figure 8-51. A12 DVM Analog Assembly, Schematic Diagram

SERVICE SHEET 18

A11 DVM DIGITAL ASSEMBLY, CIRCUIT DESCRIPTION

The DVM Digital Assembly has two functions. It includes most of the circuitry for time measurement and control of the DVM Analog Assembly (refer to the circuit description for that assembly); and it provides drive for the center frequency (FREQUENCY GHz) display, data for the bezel FREQUENCY display, and the clock for the rest of the bezel display.
In the following descriptions, refer to the schematic and to the timing diagram, Figure 8-52.

DVM 3 MHz Clock Oscillator (C)

The crystal-controlled DVM 3 MHz Clock Oscillator drives the Delay Timer and the DVM Counter. The output goes through open-collector buffer Q4.

Delay Timer (F)

The Delay Timer has two 4-bit counters, U2 and U3, configured to provide a delay of 128 clock pulses. The delay commences at the beginning of T_4 and provides a positive TTL RESET output that lasts 42 µsec. The RESET output goes to the DVM Counter and to the DVM Analog Assembly.

Data Transfer Timer (E)

The Data Transfer Timer has two functions: (1) It stops the clock to the DVM Counter when the ZERO DETECT HELD line from the DVM Analog Assembly goes low, and (2) it provides the strobe signal to transfer the count of the DVM Counter into storage latches.

When the ZERO DETECT HELD line goes low, the clock input to the DVM Counter is forced low, allowing the count of the DVM Counter to ripple through.

After the count has stabilized, the strobe line goes low, transferring the data into the buffer latches of counter U16. The strobe line then goes high, and the latches hold the count, permitting the clock input to be re-enabled.

DVM Counter (H)

The DVM Counter has two functions: (1) It measures the discharge time of the Integrator in the DVM Analog Assembly, and (2) it provides 30 Hz pulses to drive the State Counter in the DVM Analog Assembly.

Counter U16 consists of a six-decade BCD counter, six BCD latches, and a 6-to-1 BCD multiplexer. The clock input accepts the signal from the DVM 3 MHz Clock Oscillator, which is controlled by the Data Transfer Timer. The RESET input sets the counter to all zeroes when it receives a high from the Delay Timer. The strobe input transfers the count from the counter to the storage latches in U16 when the strobe line is pulled low by U14C of the Data Transfer Timer.

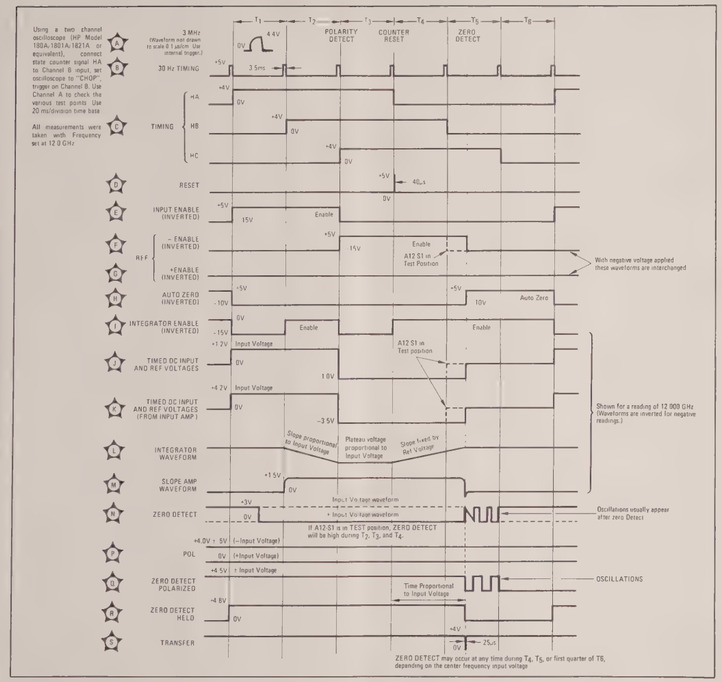

Figure 8-52. Measurement Timing Diagram for A11 DVM Digital Assembly and A12 DVM Analog Assembly

When the FREQ DISPLAY HOLD line from the Display Switch Assembly forces the strobe input high, the latches accept no further data and freeze the bezel display so that the readout is constant during photography.

The X, Y, and Z inputs of U16 receive a 3-bit binary count from the Display Scanner Counter Decoder. This count determines which decade the multiplexer selects and sends to the outputs QA, QB, QC, and QD.

The output of the fifth decade (carry) is always present on U16 pin 7 as a 30 Hz pulse train. When the pulse is low, Q5 is off and a high-level output is sent as a clock pulse to the State Counter in the DVM Analog Assembly. A low-to-high transition out of Q5 advances the State Counter. The zener diodes VR1 and VR2 respectively provide −5V and −12V supply voltages for U16.

The resistors in U23 provide pull-up to +5V and set the high-level inputs X, Y, and Z and outputs QA, QB, QC, and QD of U16.

Reference Gate (A)

The Reference Gate provides the signal to turn on +REF EN or −REF EN to the DVM Analog Assembly. When ZERO DETECT HELD, INPUT ENABLE, and POL are all high, +REF EN goes low, turning on the +REF switch in the DVM Analog Assembly. When ZERO DETECT HELD and INPUT ENABLE are high and POL is low, −REF EN goes low, and the −REF switch in the DVM Analog Assembly is turned on.

Polarity Storage (B)

The Polarity Storage flip-flop U22B examines the state of the ZERO DETECT line at the beginning of T_3. When the CENTER FREQ voltage going to the DVM Analog Assembly is positive, ZERO DETECT is low, and POL (the output of U22B) will go low on the positive transition of the INPUT ENABLE line. (Refer to the Reference Gate description for the function of the POL line.)

Display Scanner Oscillator (D)

The Display Scanner Oscillator, a CMOS RC oscillator, provides a 6.4 kHz square-wave output through the TTL buffer U10E. The Display Scanner Oscillator provides the scanner clock (establishes the strobe rate) for FREQUENCY GHz readout and bezel displays on the front panel. The output of this circuit goes to the Display Scanner Counter Decoder and to the Driver Current Ramp Generator.

Display Scanner Counter Decoder (G)

The Display Scanner Counter Decoder has two functions: (1) It provides a one-of-six decoded output to drive the center frequency display digits (FREQUENCY GHz readout), and (2) it provides the timing information for the Drive Current Ramp Generator through A12U9A and A11U9B. (The Display Ramp Generator Transition Gate A12U9A is shown on the schematic for the DVM Analog Assembly because it is physically located on that board; however, it is functionally part of the DVM Digital Assembly.)

The flip-flops U22A and U21A generate the SCN/2 and SCN/4 outputs to A12U9A.

U21B, U21C, and U21D count from binary 0 to binary 5. The number goes to U15 and is decoded to a one-of-six output to the Display Digit Driver.

Illegal Code Blanking (I)

The Illegal Code Blanking circuit blanks the least significant digit from the DVM Counter, allowing a decimal point for the bezel display to be generated at that time. If binary numbers 6 or 7 were to be erroneously generated by the Display Scanner Counter Decoder, they would be blanked.

Display Digit Driver (J)

The Display Driver receives outputs from the Display Scanner Counter Decoder, boosts current levels, and generates cathode drive for the center frequency display (FREQUENCY GHz readout) on the front panel. Since the seven-segment displays are of the common-cathode type, the Display Digit Driver must sink the current from the lit segments of the driven digit. One of the eight Darlingtons in U1 is enabled when the base is supplied current through its associated base resistor. This, in turn, requires that the open-collector inverter associated with the driver have a low input from the Display Scanner Counter Decoder.

The output voltage level of the Darlingtons is not well defined. When a Darlington is off and no segments are lit by another driver, the output will be pulled to a level near GND by the output pulldown resistor. If, however, another driver is lighting segments, the level will be between +1.5V and +2.0V on the outputs of the Darlingtons that are off. When a Darlington is on, its output level will be about +0.6V if no segment is lit, and between +1.0V and +1.5V if segments are lit, depending on the number of segments lit and individual component parameters.

Outputs HCF1, HCF2, HCF4, and HCF5, and LCF0 and LCF3 from the inverters go to the Readout Driver Assembly for the bezel display.

Drive Current Ramp Generator (P)

The Drive Current Ramp Generator generates a drive current ramp signal to the Center Frequency Segment Drivers and to the Decimal Point Driver.

The output of the Display Scanner Oscillator and the lines SCN/2 and SCN/4 are decoded by the Display Ramp Generator Transition Gate A12U9A (physically located in the DVM Analog Assembly) and U9B to generate a positive-going pulse (about 0.08 ms) which has a negative transition at the same time as the segment information changes states. The pulse is initiated approximately every 0.6 ms. This TTL input goes through resistors R17, R18, and R19 to generate roughly a ±1 mA current at the base of Q2. Since Q2 is connected as an integrator, this current will approximately equal the charging current for C16, generating a nominal rise and fall time of about 50 µsec at the collector of Q2. The output drive capability is increased by Q3, which acts as an emitter follower and has an output swing from GND to approximately +14V. C17 and R22 at the collector of Q3 prevent the ramp current from getting on the +15V power supply line. The output is of opposite polarity from the input and is delayed by the ramp rise and fall times. The ramp signal controls the rise and fall times in the Center Frequency Segment Drivers and the Decimal Point Driver.

Display Latches (K)

To ensure that BCD output data from the DVM Counter will change state only while the output of the Drive Current Ramp Generator is low, the BCD data from the counter is stored in latch U19 until the output of the Drive Current Ramp Generator reaches its lowest level.

Seven Segment Decoder (L)

The Seven Segment Decoder converts 4-bit BCD data to seven-line segment data to the Readout Driver Assembly and to the Center Frequency Segment Drivers.

If the output of the Illegal Code Blanking circuit (the BI input to U6) is low, all segment lines will go high. If a BCD zero occurs for the most significant digit of the display, a low on the ripple blanking input (RBI) line will cause all segment lines to go high, blanking that digit.

Minus Sign Gate (M)

When the POL line goes high (a negative number is to be displayed), the "g" segment line is brought low during the most significant digit to light the "g" segment (minus sign).

Center Frequency Segment Drivers (O)

The seven-segment displays (FREQUENCY GHz) are of the common-cathode type. This means that a current must be sourced to each of the segment LEDs to light it. This current is provided by the seven transistors of U7, which are all connected in an emitter-follower configuration. The magnitude of the current is determined by resistors in the Frequency Display Assembly. For any given transistor, if the output of the Drive Current Ramp Generator is high (approximately +14V) and the open-collector

inverter tied to its base is not conducting (the input from the Seven Segment Decoder is low), then base current will flow through its associated base resistor in U12 and the transistor will turn on, causing the segment to light. The output levels on lines CFa through CFg will then be slightly less than +5V.

When the Seven Segment Decoder changes state on the negative-going clock transition, the output of the Drive Current Ramp Generator will be low (approximately GND), and all segment drivers will be off. Just before a change of state, the output of the Drive Current Ramp Generator will ramp down from a high to a low and gradually turn the segment drivers off. Immediately following a change of state, the ramp will go from a low to a high, gradually turning the segment drivers on.

In this way the relatively large currents involved in the display will have controlled rise and fall times and will not generate the electrical interference usually associated with strobed digital displays.

Decimal Point Gate (N)

The Decimal Point Gate has two inputs from the FREQUENCY BAND GHz switch: B7 and B8. In the EXT MIXER mode, one of the band lines (B7 or B8) will be high (+15V). The inputs are ORed by U17A and U10A to produce a high TTL level when in either of the external mixing bands.

Decimal Point Driver (Q)

The Decimal Point Driver supplies current to the decimal point input of the Center Frequency Display Assembly. If the output of the Decimal Point Gate is high, the decimal point to the right of the third display digit will be lit; if the output is low, the decimal point to the right of the second digit will be lit. In addition, U18D inverts the LCF0 signal for use in the Readout Driver Assembly.

The decimal point drive current is controlled by the Drive Current Ramp Generator in the same way as the segment drive currents.

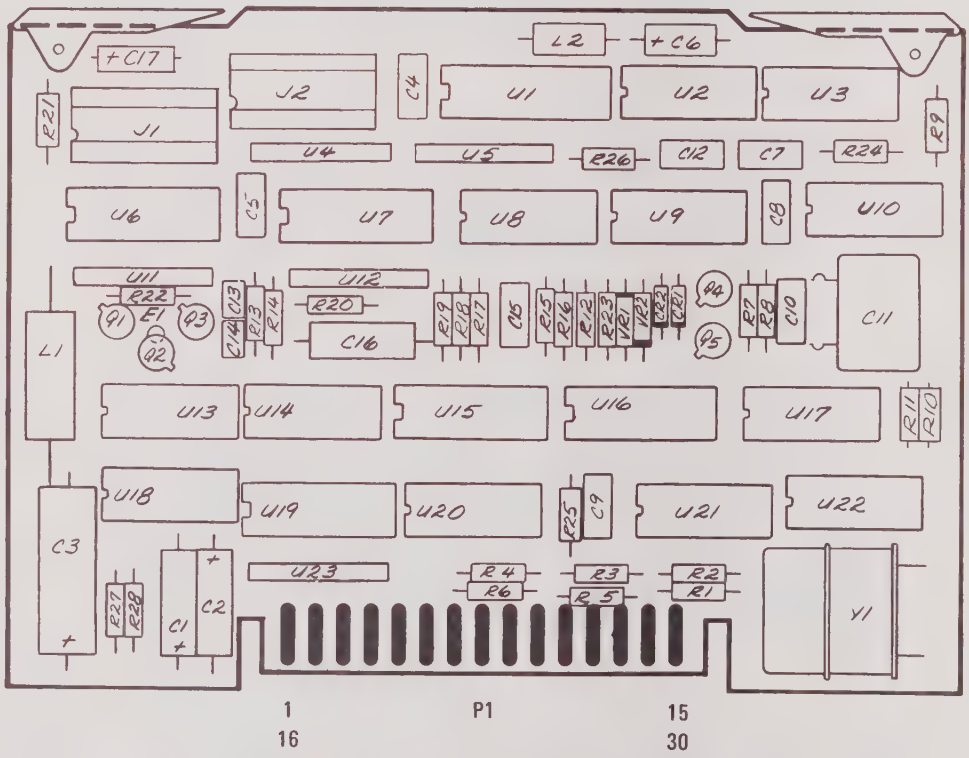

Figure 8-53. A11 DVM Digital Assembly, Component Locations

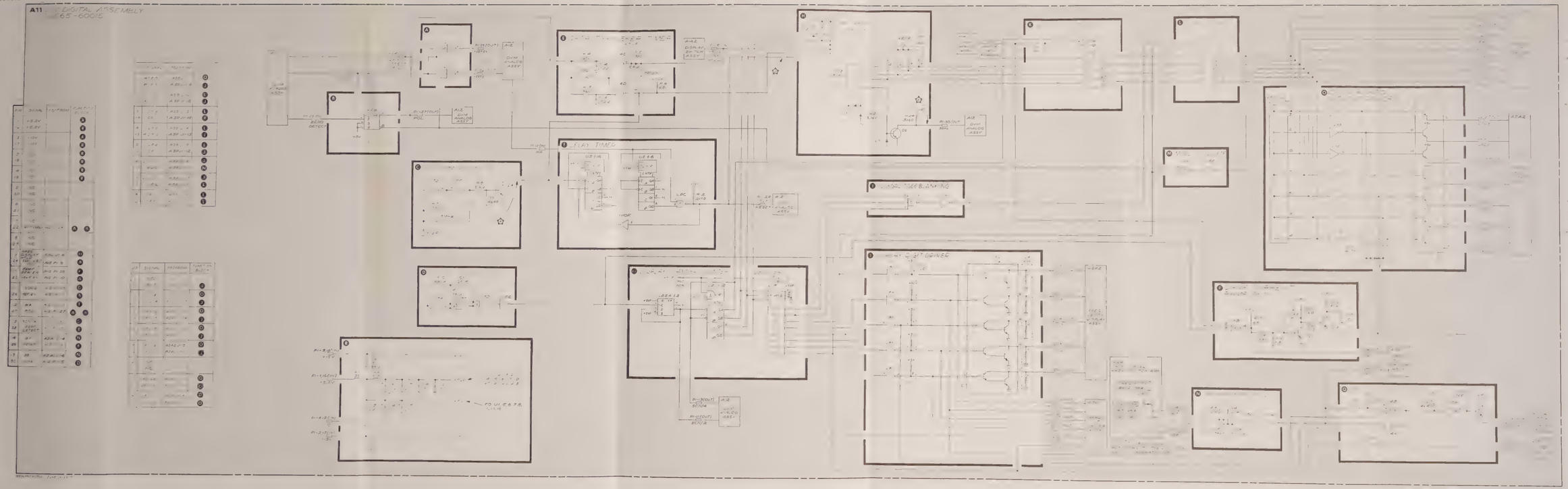

Figure 8-54. A11 DVM Digital Assembly, Schematic Diagram

SERVICE SHEET 19

A20 BIAS ASSEMBLY, CIRCUIT DESCRIPTION

The Bias Assembly has two functions. It biases the Schottky mixer diode in the First Mixer Assembly, and it controls the gain of the Variable Gain Assembly to compensate for variations in conversion efficiency as a function of frequency.

Mixer Diode Bias (I)

The mixer diode in the First Mixer Assembly is biased differently depending on the harmonic mixing number desired. For the even harmonics (B3 and B5), conventional resistive biasing is used. For example, in Band 5 (B5 line goes to +15 V) the output of U4B goes low. How low it goes is determined by V5 adjustment R2, and the output resistance is determined by adjustment R5 (labeled R5). Optimum flatness is realized by using both potentiometers.

For the odd harmonics (B1, B2, B4, and B6), the mixer diode is driven by a virtual negative resistance. This helps to keep the conduction angle constant as a function of LO power into the mixer diode. For example, in Band 4 (B4 line goes to +15V), Q1 is turned on and the output voltage is partially determined by V4 adjustment R3. The current through R29 (which is also the current through the mixing diode) is sensed by U6B, and the output changes to maintain the same conduction angle for the diode. If the output of U6B (or TP4) is monitored with an oscilloscope during full band operation, the waveform should be irregular with at least a 0.5V peak-to-peak ripple, indicating that U8 is correcting for fluctuations in LO output power as a function of frequency.

Sweep + Tune Inverter (A)

The Sweep + Tune Inverter circuit takes the frequency analog voltage, which goes from -10V to -22.3V, and develops a voltage that goes from 0V to +13V. This voltage is then processed by the compensation amplifiers and controls the Non-Linear Current Source.

Non-Linear Current Source (H)

The Non-Linear Current Source sinks varying amounts of current from the PIN attenuator diodes in the Variable Gain Assembly. The higher the base voltage of Q9, the more current is sunk through the attenuating diodes, causing the gain of the Variable Gain Assembly to decrease.

Band 1 Compensation and Band 3 Compensation (B) (D)

When Band 1 is selected, the B1 line goes to +15V, turning on FET Q3. This enables U1B to set the base voltage (and hence the attenuating current) of Q9 in the Non-Linear Current Source.

A11 DVM Digital Assembly
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At the lowest frequency end of the band, the output of the Sweep + Tune Inverter is 0V. The voltage input to the Non-Linear Current Source is the weighted average of (1) the output voltage of U1B, (2) the voltage set by R7 (labeled B1A) and (3) the voltage at the input side of R45. Voltages (1) and (3) are zero, so the output is affected by (2) only. This means that the gain at the low end of the band is set by B1A. As frequency increases, (1) and (3) come into play pulling in opposite directions. If the gain of the inverting op amp is set to zero by R8 (labeled B1B), R45 will pull the output high, thereby increasing the attenuation as a function of frequency. If R8 is adjusted full CW, the attenuation will decrease as a function of frequency.

Band 3 compensation is identical in operation to Band 1 compensation.

Band 4 Compensation, Band 5 Compensation, and Band 6 Compensation (E) (F) (G)

Bands 4, 5, and 6 compensation is similar to that of Band 1 except that more stages are added, allowing more compensation to be added at different frequencies in the band. The zener diodes VR1, VR7, VR8, VR9, VR10, and VR11 determine at what frequency the added gain is available. The feedback adjustments on the op amps determine how much gain is added.

Since Bands 4, 5, and 6 Compensation circuits are almost identical, only Band 4 Compensation is described in detail. The voltage at the cathode of VR11 (0V to 13V ramp) increases as the instrument sweeps through the band, and the diodes VR11 and VR1 are turned on in sequence. For the first 25 percent of the band neither VR11 nor VR1 conducts, and the voltage at the output (hence, the gain) is determined only by R14 (labeled B4A). Between the 25-percent and 60-percent points of the band, VR11 conducts, allowing U3A to affect the output voltage. The amount of its effect is determined by R15 (labeled B4B). Beyond the 60-percent point, VR1 also conducts, allowing U8B to affect the output voltage. The amount of its effect is determined by R100 (labeled B4C).

Band 2 Compensation (C)

Band 2 compensation is different from compensation for the other bands because it must be able to compensate for additional loss in the YTF at the lower end of the YTF range. U1A is connected as a non-inverting op amp to accomplish this. As the input voltage increases, the output voltage increases by an amount set by R10 (labeled B2B), thereby increasing the attenuation as a function of frequency. In the case of an exceptional YTF, R57 causes the attenuation to decrease as a function of frequency if R10 is set full CW. About a third of the way through the band, inverting amplifier U2B overcomes the increase in attenuation and controls the gain for the last two-thirds of the band.

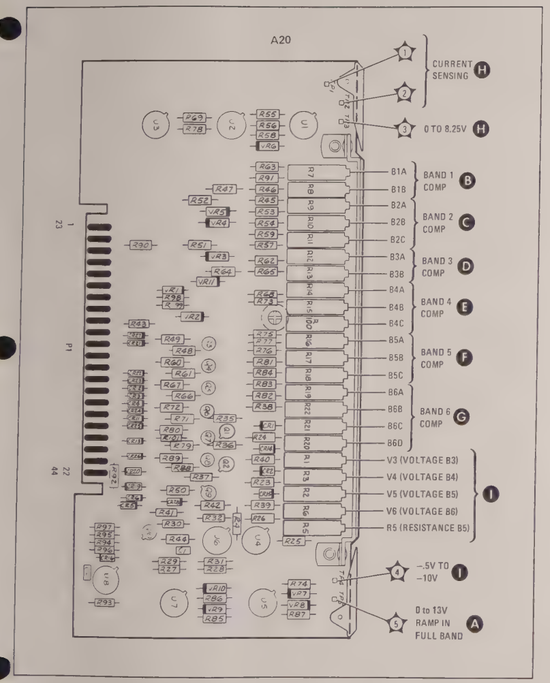

Figure 8-55. A20 Bias Assembly, Component Locations

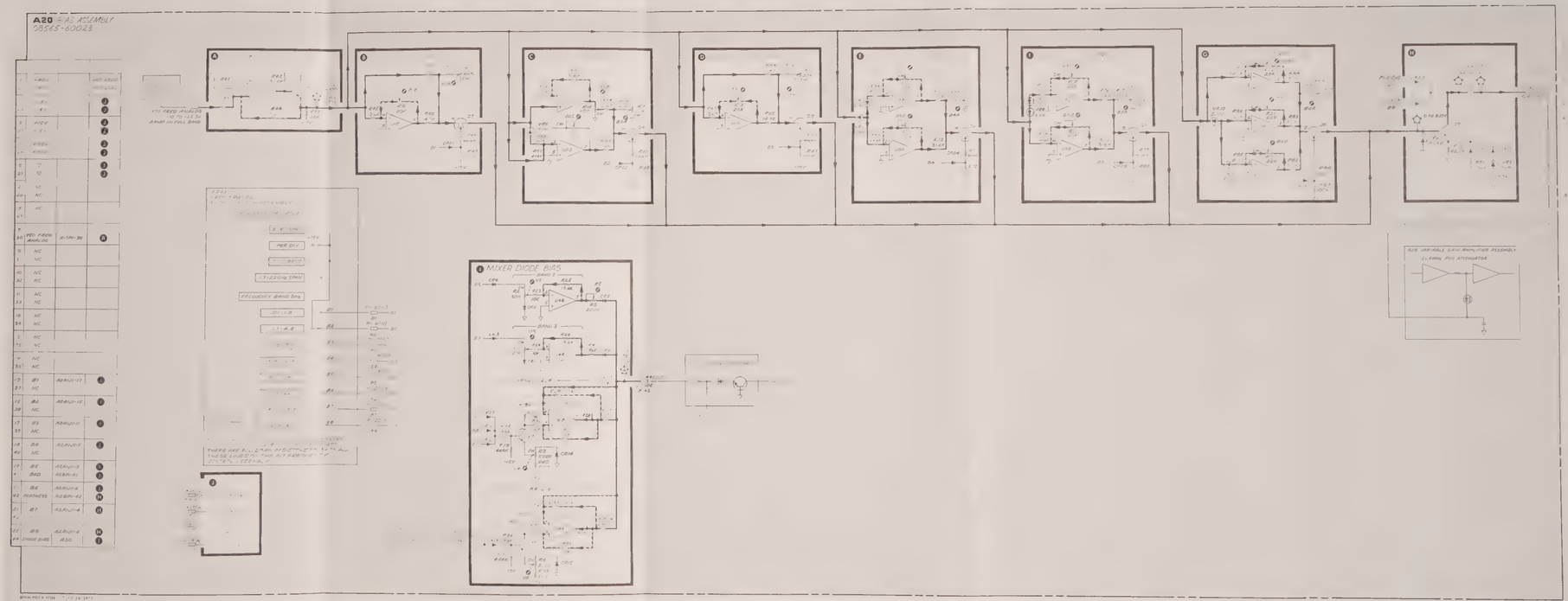

Figure 8-56. A20 Bias Assembly, Schematic Diagram

SERVICE SHEET 20

A28 VARIABLE GAIN ASSEMBLY, CIRCUIT DESCRIPTION

The Variable Gain Assembly has four functions: It amplifies the 21.4 MHz signal from the Third Converter Assembly, it varies gain (or attenuation) to compensate for changes in conversion efficiency of the RF section, it provides variable gain for reference level calibration, and it provides attenuation for the signal identification function.

Z Matching Filter (A) and IF Preamplifier (B)

Transistor Q7 provides voltage gain while transistor Q6 serves as an emitter follower output buffer. Because of collector-to-base feedback (R2), the IF Preamplifier has low (~5Ω) input impedance. The Z Matching Filter matches the 50-ohm output from the Third Converter Assembly to the IF Preamplifier.

Calibrated Flatness Compensating Attenuator (C)

The Calibrated Flatness Compensating Attenuator has about 20 dB of range to compensate for the change in conversion efficiency of the RF section through each band. The large changes in conversion efficiency which occur when switching bands is compensated for in the Band Conversion Loss Compensating Amplifier, which is discussed later. The variable attenuator is controlled from the Bias Assembly, which sinks current through PIN diodes CR1 and CR2. The more current it sinks, the greater the attenuation.

PIN RES pot R7 is used to calibrate the attenuator so that the Variable Gain Assembly can be changed without seriously affecting the flatness of the instrument. Q5 is the constant current source which can be manually switched in to accomplish this calibration.

Band Conversion Loss Compensating Amplifier (D)

The Band Conversion Loss Compensating Amplifier changes gain in discrete steps that are roughly equal to the changes in conversion loss associated with band switching in the RF section. In bands B1 and B2, the circuit has unity gain. For bands B3 through B6, more gain is switched in by diodes CR3 through CR7 (see Figure 8-57).

The values of R19, R21, and R23 are different for different First Mixer Assemblies. If a new Variable Gain Assembly or First Mixer Assembly is fitted, these resistor values must be changed. (See Section V, Adjustments.)

Reference Level Calibration Attenuator (E)

The Reference Level Calibration Attenuator functions as a common emitter amplifier with gain ranging from about +5 dB to −5 dB. The current through the PIN diodes CR8 and CR9 modulates their resistance and the gain of the amplifier. The REF LEVEL control on the front panel diverts away from the PIN diodes varying amounts of current from the +10VTV supply. If the control is open or the line broken, the amplifier will stay in the minimum gain condition.

Signal Identifier Attenuator (F)

The Signal Identifier Attenuator functions as a common emitter amplifier with gain of about 2 dB, except when the SIG IDENT line goes to +15V. This switches in an additional resistor R33 and lowers the gain to about −2 dB.

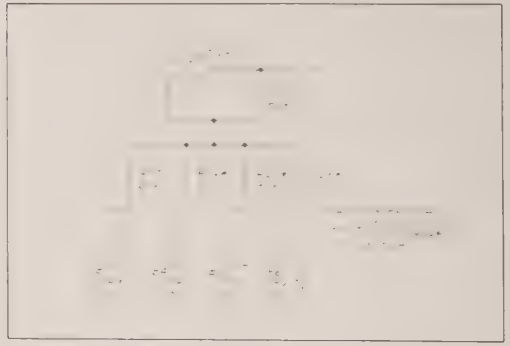

Figure 8-57. Band Conversion Loss Compensation (Gain Switching), Simplified Schematic

A20 Bias Assembly
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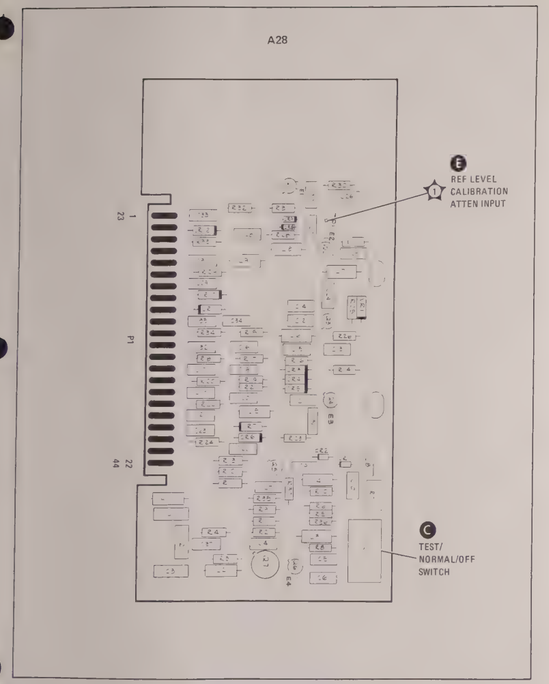
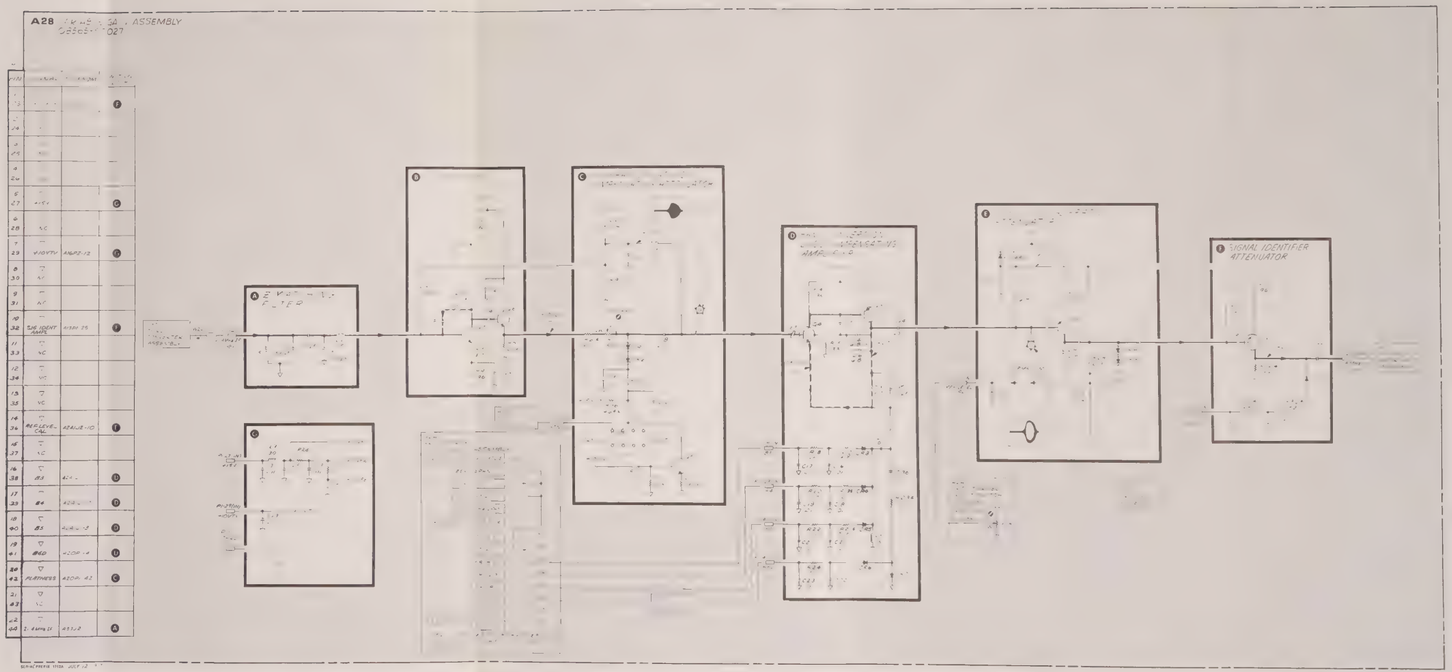


Figure 8-58. A28 Variable Gain Assembly, Component Locations



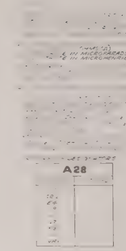


Figure 8-59. A28 Variable Gain Assembly, Schematic Diagram

SERVICE SHEET 21

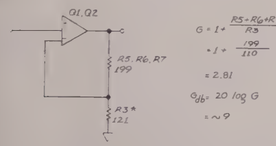
A27 BANDWIDTH FILTER NO. 1 ASSEMBLY, CIRCUIT DESCRIPTION

The Bandwidth Filter No. 1 Assembly operates at 21.4 MHz and is variable in bandwidth from 3 MHz to 1 kHz (3 MHz to 3 kHz for Option 100). The front-panel RESOLUTION BW switch is used to select one of eight (ten for Option 100) available bandwidth settings (3 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, and 1 kHz; .3 kHz and .1 kHz are available with Option 100).

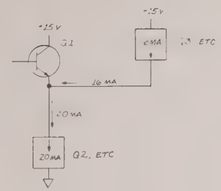
The narrower bandwidths (1 kHz through 30 kHz) are obtained from four synchronously tuned crystal filters; the four wider bandwidths (100 kHz through 3 MHz), from four synchronously tuned LC tank circuits. For Option 100, the 100 Hz, 300 Hz, and 1 kHz bandwidths are obtained by five synchronously tuned crystal filters centered at 3 MHz (refer to Service Sheet 38). Assemblies A27 and A23 are switched to the 3 kHz BW when 1 kHz, .3 kHz, or .1 kHz RESOLUTION BW is selected. The actual bandwidth filtering for these three settings is done on A26 3 MHz Filter Assembly (Option 100 only). The four stages of bandwidth filters are on two similar printed-circuit boards, Bandwidth Filter No. 1 Assembly (A27) and Bandwidth Filter No. 2 Assembly (A23). (Two LC tank circuits and two crystal filters are on each board.) The four crystals in the two bandwidth assemblies (A23Y1, A23Y2, A27Y1, and A27Y2) are a factory-selected matched set. If replacement of a bandwidth filter assembly is necessary, the new board is shipped with two crystals installed and the other two crystals (which must be used to replace the existing two crystals in the good bandwidth filter assembly) are packaged separately. The separate package of crystals is included with the new bandwidth ter board. In addition to the filter stages, each Bandwidth Filter Assembly provides 10 dB of gain in both LC and crystal filter operation. (There is some gain in the "unity" gain buffer amplifiers.)

10 dB Input Buffer Amplifier B

The 10 dB Input Buffer Amplifier functions as a non-inverting op amp.



In the crystal mode (bandwidths ≤ 30 kHz), the amplifier includes Q3. The biasing of the amplifier is independent of its ac (21.4 MHz) operation but is very critical for its proper functioning. If a malfunction occurs, the dc bias should be checked first.



The current through Q1 is determined by the difference between two current sources, one involving Q3 and the other involving Q2. The most convenient way to find the current from each source is to measure the voltage across each emitter resistor. (A 1 kΩ resistor should be used in series with the voltmeter probe tip to prevent the circuit from oscillating and giving an erroneous reading.) For Q3 and Q6, the current through R58 and R60 must be included. If results are inconsistent, the emitter resistor should be checked also. Check to see that the BW5 line is at the voltage specified (~±0.3V) in the table on the schematic.

In the LC mode (the four wider bandwidths), the BW5 line goes to 14.8V and turns off the current source Q3. The current supplied by Q3 in the crystal mode is now supplied through CR1 and R13 from the BW5 line. In the LC mode, the current through Q1 can be found by subtracting the current through R13 from the current through R8.

Unity Gain Buffer Amplifier F

The Unity Gain Buffer Amplifier is the same as the 10 dB Input Buffer Amplifier except that it has a FET input (Q5) and is connected for unity gain. The input is selected by the BW5 line from CR9 in the LC mode or from CR8 in the crystal mode.

In the crystal mode, the current through Q5 is determined by the difference between the current sourced by Q6 and that sunk by Q7: about 4 mA. A significant deviation from this current should be reflected by the gate-to-gate source voltage of Q5. The source should be at least 0.2V more positive than the gate, but not more than 1.5V more positive. If the difference is less than 0.2V, the FET current is too high; if the difference is greater than 1.5V, the FET current is too low. In either case the FET could also be defective. To determine precisely the current through Q5, the difference between the current through R38 and that through R60 should be subtracted from the current through R30. If the results are inconsistent, check the above-mentioned resistors.

In LC mode of operation, current is supplied through R37 and CR19 from the BW5 line instead of through Q6. The difference between the current through R37 and that through R30 yields the FET current.

Output Buffer Amplifier I

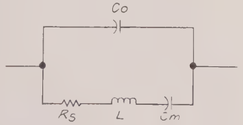
The output Buffer Amplifier is a complementary pair of transistors in which Q9 acts as a source follower boosted by Q10. The current through FET Q9 is set by R53:

$$I_{FET} = \frac{V_{be\ (Q10)}}{196\Omega} \approx \frac{.7}{196\Omega} \approx 3\ mA$$

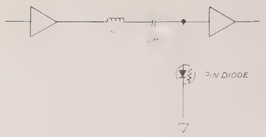
The total current through Q9 and Q10 is set by R54. The input is selected by the BW5 line from either CR16 in the LC mode or CR15 in the crystal mode.

Crystal Filtering Circuits E H

The bandwidths 1 kHz, 3 kHz, 10 kHz, and 30 kHz are obtained by crystal filtering. The crystals are used in series resonant mode and can be modeled as a series resonant circuit with a parallel capacitance:



The parallel capacitance (C_0) and series resistance (R_s) are not desired and are compensated for in the circuit, resulting in this simplified schematic of a single pole of crystal filtering:



The PIN diode CR4 functions as a variable resistor at 21.4 MHz. As the resistance is lowered by increasing the current in the BW6 line, the bandshape becomes narrower. The bandwidth of one pole widens to approximately 70 kHz when the PIN is turned off completely at the 30 kHz BW setting. (For a four-pole filter, the bandwidth of each pole is about 2.3 times the bandwidth of all four poles taken together. The bandwith of two poles is about 1.5 times the bandwidth of all four poles taken together).

A simplified schematic of a crystal pole, including compensation for R_S and C_0 in the crystal and input capacitance of the buffer amplifier, is shown in Figure 8-60.

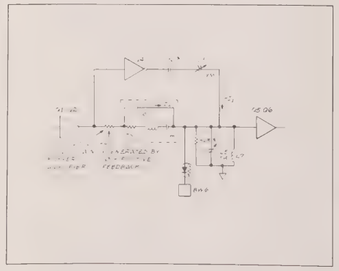


Figure 8-60. Crystal Pole, Simplified Schematic

The SYM adjustment C15 compensates for C_0 by producing a current ($-I_1$) that is equal to the current (I_1) through C_0 of the crystal but opposite phase. These currents cancel and nullify the effect of C_0. The positive feedback from the collector of Q8 generates a negative output resistance that cancels R_S of the crystal. This is approximated by resistor R6 in the 10 dB Input Buffer Amplifier and potentiometer R31 in the Unity Gain Buffer Amplifier.

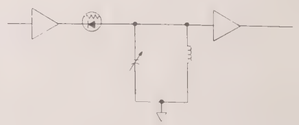
The input capacitance of the buffer amplifier, printed circuit board capacitance, PIN capacitance, and the centering (CTR) capacitor C25 are in parallel resonance with L7. These components have negligible effect on the band shape and as long as C25 has sufficient range to "dip" the bandshape, they can be ignored in analyzing the remainder of the circuit.

The PIN diode CR4 controls bandwidths from 1 kHz to 10 kHz. For the 30 kHz bandwidth, CR4 is back biased, and R23 sets that bandwidth. If the 30 kHz bandwidth is much too narrow, even with CR4 back biased, the circuit may be loaded by a bad buffer amplifier (Q5, Q7) or inverting amplifier (Q4). If the bandwidth is only slightly narrow, it may be widened by padding R23. If the narrowest bandwidths (1 kHz or 3 kHz) have too little gain, and it cannot be increased enough by R31, either the crystals have too high a series resistance (defective crystal); or the output resistance is not negative enough (defective buffer amplifier or Q3).

Almost any defect in the filter boards (A23 and A27) will result in a faulty dc bias condition in one of the three buffer amplifiers on each board. The dc bias of each stage is less straightforward than ac (21.4 MHz) operation and should be checked carefully.

LC Filtering Circuits D G

The two LC filtering circuits are used for the wider bandwidths (100 kHz through 3 MHz). They are similar in function; the First LC Pole circuit is described. A schematic of the simplified equivalent circuit is shown below:



The LC filter utilizes a metallized inductor L6 in parallel with three capacitors: C23 (LC CTR) for centering, C21 for temperature compensation, and C20*. The parallel circuit is driven through PIN diode CR3, which functions as a variable resistor. The BW7 line sets the current through CR3. Higher resistance results in narrower bandwidth. A simplified schematic of the First LC Pole circuit is shown in Figure 8-61.

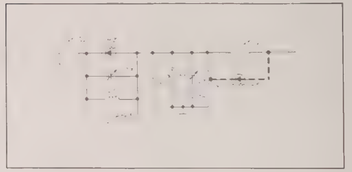


Figure 8-61. First LC Pole, Simplified Schematic

C73 and L5 tune out the capacitance of CR3. R19* sets the 100 kHz bandwidth when CR3 is back biased (i.e., highest resistance). CR5 is controlled by the LC FEEDBACK pot R26 and compensates for losses in the parallel resonant circuit. (In the Second LC Pole circuit, fixed resistor R56* replaces CR5.

Low gain in one of the poles in the 100 kHz bandwidth is caused by:

1. The pole being centered at some frequency other than 21.4 MHz (a defective metallized inductor is most common)
2. The Q of the pole being too low (not a common failure)
3. Insufficient feedback from the buffer amplifier
4. Defective buffer amplifier that is loading the circuit

If the 100 kHz bandwidth amplitude is all right, but that of the 300 kHz bandwidth is too low, either C73 or C74 might not be properly adjusted. If the 300 kHz amplitude is too high, the four LC poles are not tuned close enough to the same frequency. In either case, refer to Section V, Adjustments.

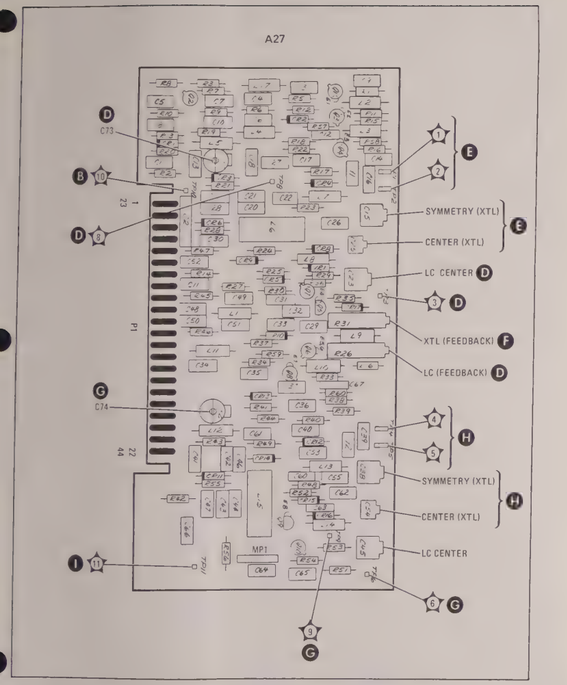


Figure 8-62. A27 Bandwidth Filter No. 1 Assembly, Component Locations

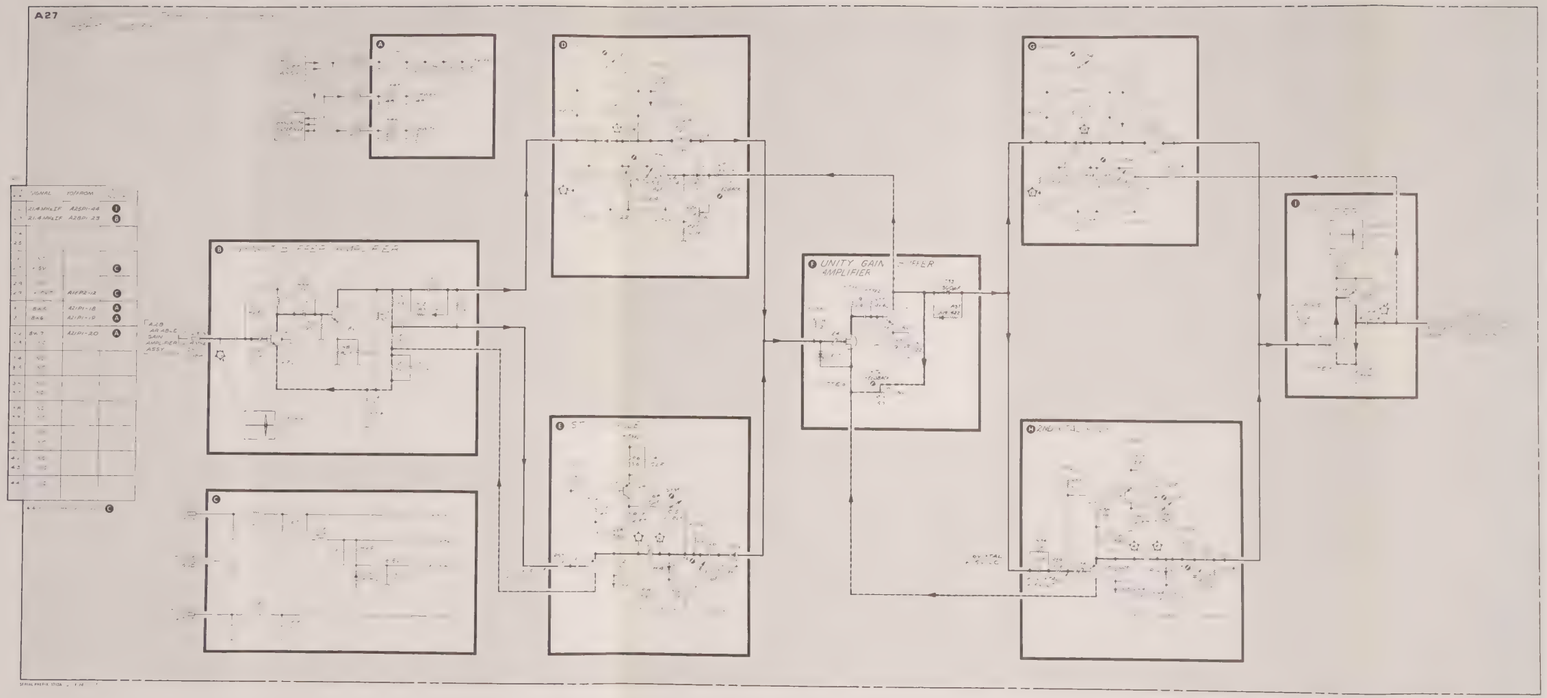


Figure 8-63. A27 Bandwidth Filter No. 1 Assembly, Schematic Diagram

SERVICE SHEET 22
A24 STEP GAIN AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION

NOTE

For Option 100, see Service Sheet 39.

The Step Gain Amplifier Assembly contains three amplifier stages to provide a 0 to 50 dB amplification of the 21.4 MHz third IF signal. A simplified schematic of the assembly is shown in Figure 8-64. The amplifier stages are selected by the front-panel REF LEVEL dBm switch. At the output of the final amplifier is a two-section bandpass filter. In conjunction with the front panel REFERENCE LEVEL FINE control, the Step Gain Amplifier Assembly also contains the circuitry for the 0 to −12 dB fine control for the reference level. A TEST/NORM switch is available; in TEST position, tests are made at a low gain level.

0 — 12 dB Control (A)

The front-panel REFERENCE LEVEL FINE control provides approximately 0.3 to 12.3 dB of attenuation at the base of Q7. By regulating the current flow through the PIN diode CR3, the amount of signal attenuation is controlled. For example: if diode current flow is increased, more RF signal is shunted or bypassed to ground. C12 provides the RF ground and also isolates from ground the variable dc from the REFERENCE LEVEL FINE adjustment.

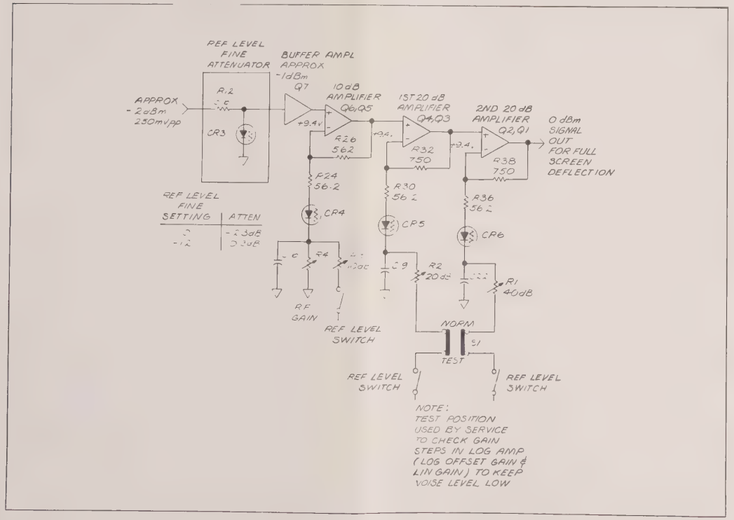


Figure 8-64. A24 Step Gain Amplifier Assembly, Simplified Schematic

A minimum current flow through the PIN diode (maximum diode resistance) is established by the − 12 dB adjustment R6 so that the diode is never completely cut off. Adjustment of R6 sets the 0.3 dB point and is adjusted with the REFERENCE LEVEL FINE control fully clockwise (− 12 position).

The maximum current flow through the PIN diode is set by the 0 dB adjustment R5. R5 is adjusted to the 12.3 dB attenuation point with the REFERENCE LEVEL FINE control fully counterclockwise (0 position).

Transistors Q8 and Q9 are identical current sources. The maximum current is set by R5 in the common base circuit. Diode CR1 provides temperature compensation for the transistors.

Q8 provides current for a bias voltage applied to the anode of the PIN diode CR3. The voltage source consists of R6, R17, and CR2. CR2 provides temperature compensation for the PIN diode. Inductor L5 isolates the current source from the RF signal.

Q9 provides current for a variable voltage source at the cathode of CR3. The REFERENCE LEVEL FINE control, in parallel with R9, is used to match the PIN diode resistance changes. The voltage at the PIN cathode is varied to control CR3 current flow. When the REFERENCE LEVEL FINE control is fully clockwise, the PIN diode is at minimum conduction and maximum signal is applied to the base of Q7. Conversely, when the control is fully counterclockwise, the PIN diode is forward biased at maximum conduction, and minimum signal is applied to Q7.

Buffer amplifier Q7 operates as an emitter-follower and provides isolation between the 0 — 12 dB Control circuit and the 10 dB Amplifier circuit.

10 dB Amplifier, First 20 dB Amplifier, and Second 20 dB Amplifier (B) (C) (D)

The three step gain amplifiers (10 dB Amplifier, First 20 dB Amplifier, and Second 20 dB Amplifier) can be considered as operational amplifiers. An equivalent circuit for the three stages is shown in Figure 8-65. The gain for each amplifier is $A_V = 1 + R_f/R_i$. The feedback resistance R_f for the 10 dB Amplifier is R26, 562 ohms; and for the 20 dB Amplifiers is R32 and R38, 750 ohms. The input resistance R_i is a combination of a fixed series resistance (56.2 ohms) and the controlled resistance of the PIN diodes. The resistance of the PIN diodes is approximately 10 to 1000 ohms and increases as the forward bias current is decreased from 10 mA to 10 μA. R_i is approximately 260 ohms for the 10 dB Amplifier and 83 ohms for the 20 dB Amplifiers. Selection of the correct combination of step gain amplifiers is effected by the front-panel REF LEVEL dBm control. Rotating the switch grounds the emitter circuit of the selected amplifier(s), allowing current to flow through the PIN diode(s). The possible switch combinations allow the gain to vary from unity (all switches open) to 50 dB maximum gain with all three emitter circuits grounded.

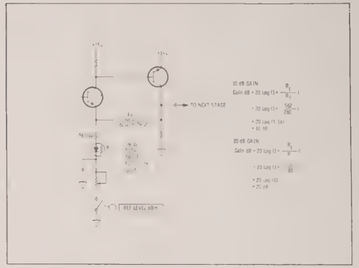


Figure 8-65. Equivalent Circuit For Step Gain Amplifiers

A TEST/NORM switch S1 is included in the emitter paths of the 20 dB step gain amplifiers. The switch provides a fixed 10 dB of gain for use when making LOG amplifier adjustments.

21.4 Bandpass Filter (E)

The output of the step gain amplifiers is coupled through a two-section bandpass filter. The filter consists of L9, L10, C24, and C25 and passes only the 21.4 MHz signal.

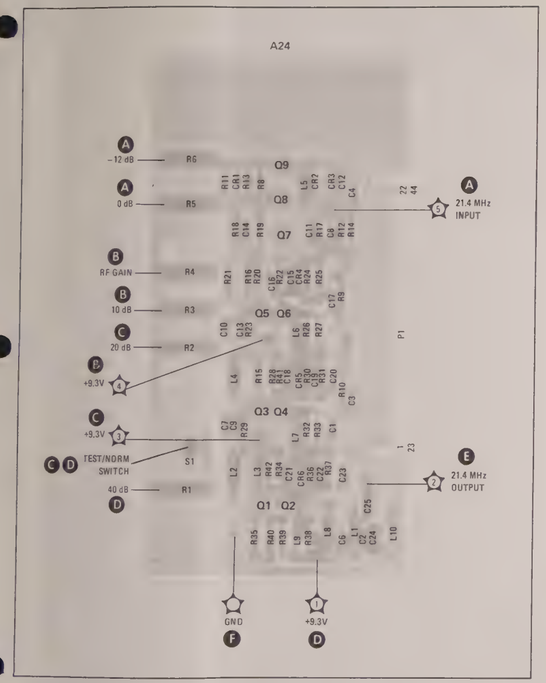


Figure 8-66. A24 Step Gain Amplifier Assembly, Component Locations

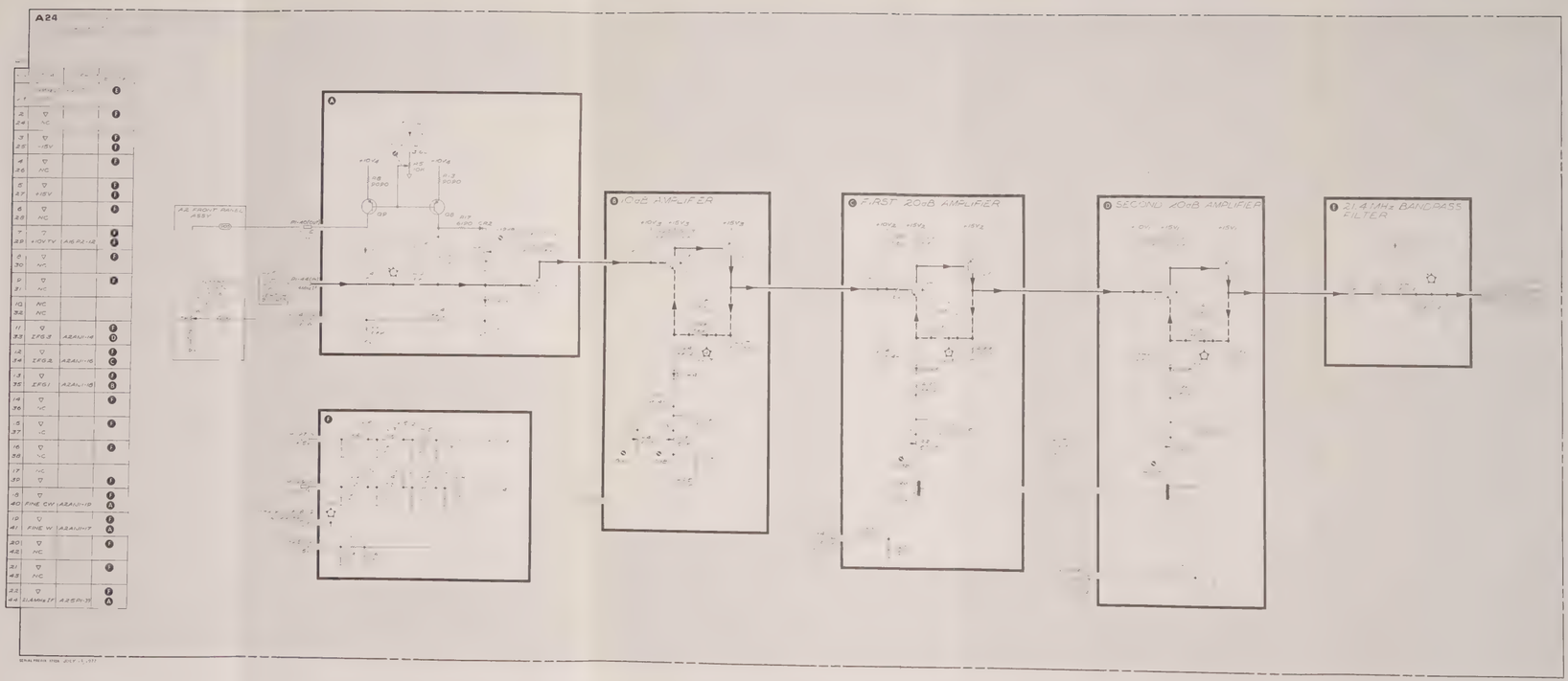


Figure 8-67. A24 Step Gain Amplifier Assembly, Schematic Diagram

SERVICE SHEET 23
A23 BANDWIDTH FILTER NO. 2 ASSEMBLY, CIRCUIT DESCRIPTION

The Bandwidth Filter No. 2 Assembly is very similar to A27 Bandwidth Filter No. 1 Assembly, and the components have the same reference designators. Following are the differences between the two boards:

1. A23 has a limiting diode from the input (P1-23) to ground; A27 does not.

2. A23R3 in the 10 dB Buffer Amplifier is 121 ohms; A27R3 is 110 ohms. The result is that A23 has about 0.5 dB less gain than A27.

3. A23C64 in the Output Buffer Amplifier is 0.01μF; A27C64* is 470 pF. A27C64* is factory selected so that the REFERENCE LEVEL FINE control on the front panel will have the same effect in the 100 kHz bandwidth as it does in the 1 MHz bandwidth if Option 100 is not installed. If Option 100 is installed, the value of A27C64* is not critical.

Refer to A27 Bandwidth Filter No. 1 Assembly for a complete circuit description.

◀ A24 Step Gain Amplifier Assembly
SERVICE SHEET 22

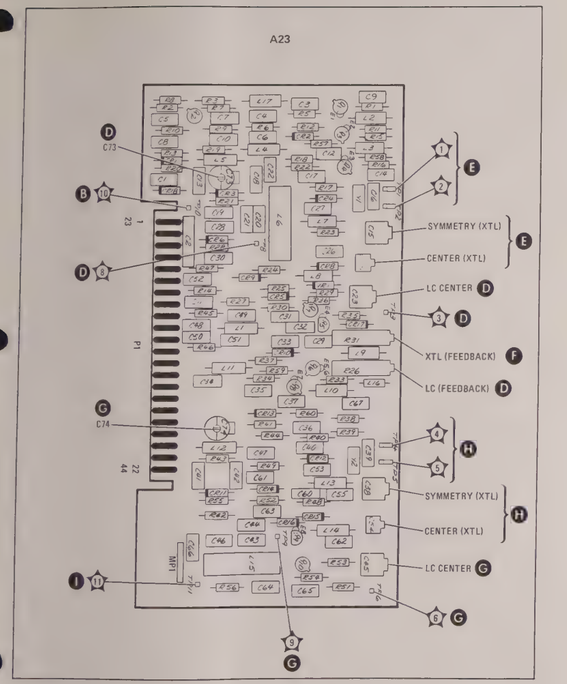


Figure 8-68. A23 Bandwidth Filter No. 2 Assembly, Component Locations

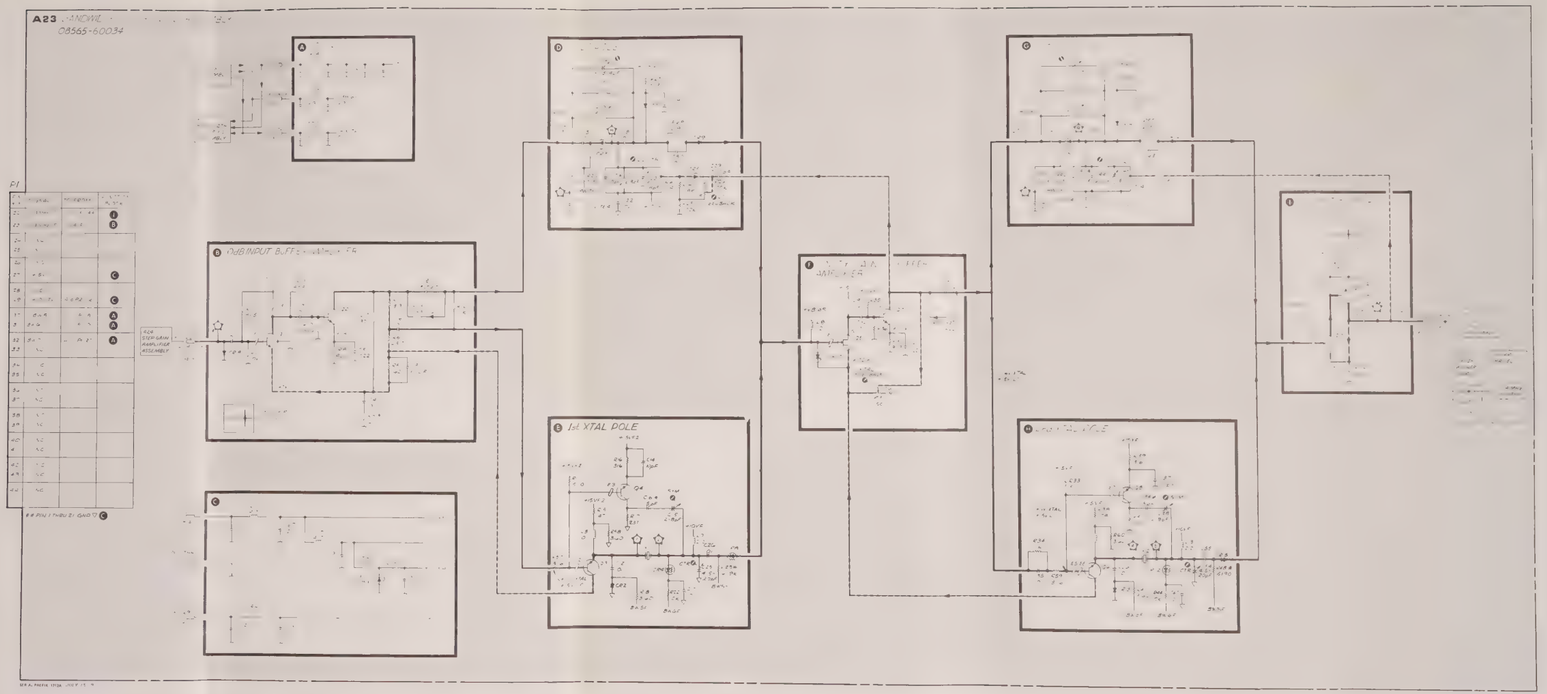


Figure 8-69. A23 Bandwidth Filter No. 2 Assembly, Schematic Diagram

SERVICE SHEET 24
A22 LOG AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION

The Log Amplifier Assembly provides the ability to display signals in either a linear mode or 70 dB log mode. It also operates with the Step Gain Amplifier Assembly to provide the last 40 dB of step gain amplification of the 21.4 MHz IF signal.

The Log Amplifier Assembly has seven amplifier stages, with each stage capable of providing both linear and logarithmic amplification. Following the amplifier stages, the amplified IF signal is detected to produce the vertical signal for the display. An offset circuit, following the detector, is used in the log mode to offset the vertical output in steps equivalent to 40 dB of IF gain.

Amplifier Stages (1st through 7th)

A B C D E F G

The seven amplifier stages are similar in operation. They vary in their use as linear or log amplifiers, depending on the setting of the AMPLITUDE SCALE switch on the front panel.

Log Mode of Operation

The seven amplifier stages limit the gain in sequence to provide 70 dB of log amplification. Each stage consists of an emitter follower used as a voltage source to drive a common-base amplifier whose gain decreases with increasing signal level.

Log Amplifier Gain. A simplified log amplifier stage is shown in Figure 8-70. In the log mode of operation Q23 is on, forward biasing the log diodes CR11 and CR13, which are Schottky diodes with a forward bias voltage of approximately 0.4V. The gain of the amplifier is set by the ratio of R34 to the total resistance R_T between the emitters of Q3 and Q4. The formula for computing gain is:

$$\text{Gain} = 1 + \frac{R34}{R_T}$$

R_T is at a minimum (approximately 150 ohms) for small signals when the ac signal current in the log diodes CR11 and CR13 is small compared to their dc bias current. As the ac signal level is increased, the ac signal current increases to the level of the dc bias current and R_T increases because of current limiting in the diodes.

The initial gain of the stage (approximately 10 dB) is set by the dc bias current through the log diodes. The bias current is controlled by the temperature variable −10V supply at the emitter of Q23. The final gain of the stage (0 dB) is set by the circuit configuration (R_T becomes very large) and can be set further by selection of R46*.

Linear Mode of Operation

Linear Gain. In LIN mode, the limiting action is removed from each of the seven amplifier stages. Referring to Figure 8-70, Q23 is turned off in LIN mode and the dc bias current in the log diodes CR11 and CR13 is zero. With dc bias current zero, the total resistance R_T is maximum and the stage has approximately unity gain. In some stages, the log diodes may be turned on by an IF gain step (IFG5 and IFG6) when −10V is applied to either CR1 or CR2. However, the signal levels in these stages will always be low enough in LIN mode that no limiting takes place in the log diodes.

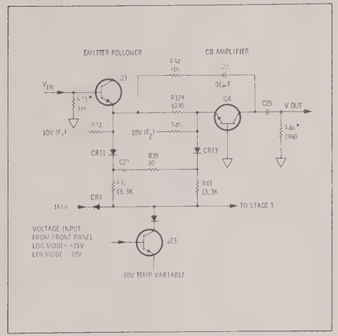


Figure 8-70. Simplified Log Amplifier Stage

Linear Step Gain. The 10 dB of linear gain of each stage at low signal levels in the log mode is used in the LIN mode as switched gain. The gain can be switched on or off by switching the bias current. This type of gain is used in amplifier stages 2, 3, and 4 to obtain 30 dB of gain and is switched in as follows. With INPUT ATTEN at 0 dB and REF LEVEL dBm at −70, the −10V is routed to the IF Gain (IFG5) control line. The −10V forward biases CR2 and the −10V is applied to the log diodes CR20 and CR21 in stage 4, providing 10 dB of gain. When REF LEVEL dBm is at −80, the −10V is routed to IFG6, CR1, and the log diodes in stages 2 and 3, providing 20 dB of gain. All three stages (2, 3, and 4) are activated when REF LEVEL dBm is at −90, providing 30 dB of gain.

Alternate Linear Gain. In the last three amplifier stages, the signal current is too large for the bias current of the log diodes, and an alternate method to obtain linear gain must be used. This alternate gain path selects 10 dB of gain as follows. With REF LEVEL dBm in −60, −70, −80, or −90, −10V is routed to IF Gain 4 (IFG4), R74*, and the cathode of CR26. The 3480-ohm resistor R74* allows a higher dc bias current for CR26. This provides a signal path through R84 and CR26 that does not limit.

In the sixth and seventh stages, the alternate signal path is used to set the gain at about 5 dB per stage. The purpose of this fixed gain is to scale properly between the LOG and LIN modes. These stages are activated by the −10V from the LOG/LIN switch A2S2 to the cathodes of CR14 (R38) and CR29 (R120). R16*, in the signal path of the seventh stage, is factory selected to establish the correct linear gain for the individual Log Amplifier Assembly.

Log Mode Temp Controlled Attenuator H

LOG/LIN Relationship. In LIN mode, when approximately 700 mV rms (+10 dBm) is applied to the input of the log amplifier, the voltage at the output of stage 7 (TP7) is about 1.5 Vrms. With the same input signal in LOG mode the output at TP7 is about 2.0 Vrms. To maintain equal relationship with maximum input signal (trace at the top of the display) the output in LOG mode must be attenuated. This relationship is set by using a PIN diode attenuator and the LOG/LIN adjustment R2.

PIN Diode Attenuator. In LIN mode, −10V is applied through R52 to the base of Q16, turning it on. This causes the PIN diode CR16 to be at maximum conduction. The −10V is also coupled to the anode of PIN diode CR18 and it is off. Therefore, in LIN mode there is no attenuation, and the signal from Stage 7 is coupled directly to emitter follower Q17. However, in LOG mode, +0.7V is applied to CR18 anode and +15V to the base of Q16 through R52; CR18 is forward biased and Q16 is open. PIN diode CR16 operates with a fixed bias current set by CR2, R53, and R60. PIN diodes CR16 and CR18 form a voltage divider to the incoming signal with CR18 operating as a variable impedance. The amount of signal attenuation depends upon the impedance of CR18, which is set by the LOG/LIN adjustment R2.

Detector I

The signal output is applied to a low impedance driver Q17, which is the voltage source to drive Q18. Q18, the current driver for the detector, converts voltage variations into current variations. Q19, a half-wave rectifier, is biased just below cutoff by CR24. When the input ac signal is positive, Q19 is in conduction but is cut off during the negative transition. The detector output is routed to a low pass filter and unity-gain buffer amplifier, Q20 and Q21, to provide the video output.

Log Offset J

The last 40 dB of log step gain is produced in this circuit. When this gain is used, there is already a full 50 dB of gain in the Step Gain Amplifier Assembly, so the noise of the analyzer is amplified into the log range of the Log Amplifier Assembly. This makes further amplification unnecessary since any signal below the log range of the Log Amplifier Assembly would be buried in the noise. The output of the detector can then be offset in 100-mV steps corresponding to 10 dB of IF amplification. This offset is provided by Q22 operating as a stepped current source into R121. With the AMPLITUDE SCALE switch in one of the LOG/DIV positions, +15V is routed through the contact closures of the REF LEVEL dBm switch to the IF gain control lines IFG4, IFG5, and IFG6. With an IF gain control line connected to +15V, a log-shift diode CR30, CR31, or CR32 is forward biased and this bias current, determined by R122, R123, or R124 flows into the emitter of current source Q22. IFG4 and IFG5 each provide 10 dB (100 mV) of log offset gain and IFG6 provides 20 dB (200 mV). The LOG GAIN adjustment R1 sets the operating point of Q22 for 100 mV steps.

Temperature Compensation Power Supply L

Temperature compensation is provided for the −10V and −7V regulators. Q24 is connected as a diode and operates as the temperature sensing element. Temperature variations cause changes in collector voltage. The voltage change at Q24 is applied to U1A and to the positive input of U1B to regulate the two voltages. The −10V regulator provides approximately −10V to a filter network for distribution throughout the Log Amplifier Assembly. The regulated −7V is the current source for the PIN diode CR18.

LIN Gain Adjust. The linear gain steps are set to 10 dB per step by adjusting the LIN GAIN control R3. This control changes the output voltage of the −10V regulator U1A. Changing the −10V adjusts the diode bias current to the proper value for 10 dB gain steps.

Adjustments

NOTE

For complete adjustment procedure see Section V.

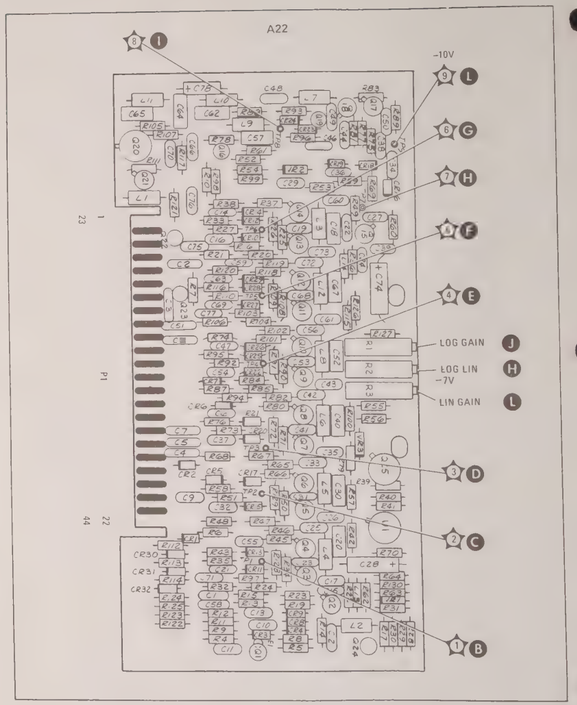
LIN GAIN Adjustment. The LIN GAIN adjustment R3 adjusts the −10V regulator output voltage. However, this voltage is set for 10 dB linear gain steps and not for −10V.

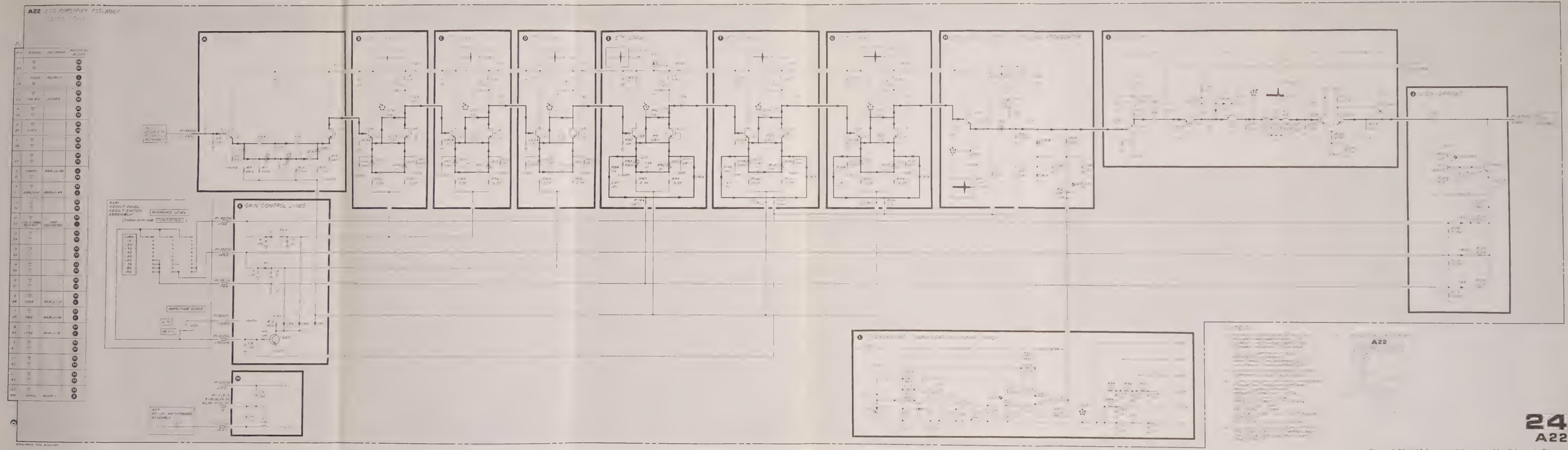
LOG/LIN Adjustment. The LOG/LIN adjustment R2 is used primarily to adjust the slope of the 70 dB log amplifier output curve (log fidelity). This adjustment is made after the LIN GAIN adjustment since the −10V regulator output also affects the log fidelity curve. The relationship between LOG and LIN modes is primarily adjusted by selecting R16*. The value of R16* sets the initial gain in the LIN Mode with 0 dB linear step gain. Only small variations between LOG and LIN outputs are corrected with R2.

LOG GAIN Adjustment. The LOG GAIN adjustment R1 is set for 100 mV steps (a total of 400 mV) at the vertical output (in 10 dB/div) with constant input.

NOTE

The TEST/NORM switch in the Step Gain Amplifier Assembly, when in TEST position, limits the gain of the Step Gain Amplifier Assembly to 10 dB in standard instruments. In instruments with Option 100, the gain is limited to about 27 dB. This allows the LOG and LIN step gain controls to be tested with a low level of input noise.





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A22

Figure 8-72. A22 Log Amplifier Assembly, Schematic Diagram

SERVICE SHEET 25
A21 VIDEO ASSEMBLY, CIRCUIT DESCRIPTION

NOTE

For Option 100, see Service Sheet 40.

The Video Assembly filters the detected signal from the Log Amplifier Assembly as selected by the VIDEO FILTER and RESOLUTION BW switches. It scales the amplitude according to the AMPLITUDE SCALE selected at the front panel. It also controls the Bandwidth Filter No. 1 and No. 2 Assemblies to determine selection of RESOLUTION BW, and it varies the AUTO Sweep Time according to VIDEO FILTER and RESOLUTION BW settings.

The Video Assembly contains the Video Filter Resistor Select, the RESOLUTION BW control circuitry (consisting of the Crystal-LC BW Select, the Crystal Bandwidth and Video Filter Capacitor Select, and the LC Bandwidth and Video Filter Capacitor Select), and the Amplitude Scale circuitry (consisting of the First Video Amplifier, the Scale Attenuator, and the Second Video Amplifier).

Video filtering is accomplished by the use of an RC filter. The amount of filtering is proportional to the resolution bandwidth; therefore, whenever the VIDEO FILTER switch or the RESOLUTION BW switch position is changed, it is necessary to change the degree of filtering. The VIDEO FILTER switch varies the resistive portion of the RC filter by switching in different resistors in the Video Filter Resistor Select circuit. The RESOLUTION BW switch selects the capacitive portion of the RC filter by switching in different capacitors in the Crystal Bandwidth and Video Filter Capacitor Select circuit and the LC Bandwidth and Video Filter Capacitor Select circuit.

When the SWEEP TIME/DIV switch is set to AUTO the sweep time is controlled to provide the fastest possible sweep time while still maintaining amplitude calibration. Therefore, when either the VIDEO FILTER or RESOLUTION BW setting is changed, the sweep time is changed by varying the current supplied by the Auto Sweep Time Video Filter (AST VF) line or the Auto Sweep Time Bandwidth–Frequency Span (AST BW-FS) line.

The Crystal-LC Bandwidth Select circuit decodes information from the RESOLUTION BW switch and controls the BW5 line to determine whether crystal or LC filters are used in the Bandwidth Filter No. 1 and No. 2 Assemblies. LC filtering is used for the four wider bandwidths (100 kHz to 3 MHz) and crystal filtering, for the four more narrow bandwidths (1 kHz to 30 kHz.)

When LC filtering is used, the LC Bandwidth and Video Filter Capacitor Select circuit controls (through the BW7 line) the current for the PIN diodes in the Bandwidth Filter No. 1 and No. 2 Assemblies. When crystal filtering is used, the Crystal Bandwidth and Video Filter Capacitor Select circuit performs this function through the BW6 line.

Changes in the AMPLITUDE SCALE are accomplished by first amplifying the video signal and then attenuating it various amounts. The accuracy of absolute measurements is maximized by minimizing errors introduced in the peak signal voltage. This is accomplished by the First Video Amplifier (see Figure 8-73), which first offsets the 0V to +0.8V video signal to −0.8V to 0V and then amplifies it by a gain of 9. This amplified signal is then attenuated in the Scale Attenuator, which is controlled by the AMPLITUDE SCALE setting on the front panel. The Second Video Amplifier offsets the signal again and amplifies it by a gain of 1.11 so that +0.8V represents a full-screen deflection. The VERTICAL signal is then sent to the Y Deflection Amplifier Assembly to be displayed on the CRT, to the Z Axis Amplifier Assembly for the baseline clipper, to the Sweep Generator Assembly to trigger the sweep in the VIDEO mode, and to the rear panel for the VERTICAL OUTPUT.

Video Filter Resistor Select (A)

With the VIDEO FILTER switch in OFF, +15V is routed through the switch to the bases of Q4 and Q6. These transistors turn on, turning on Q1 and grounding the AST VF (Auto Sweep Time Video Filter) line to the Sweep Generator Assembly. The only series resistance the signal sees is the output of the Log Amplifier Assembly (approximatley 147Ω). In the .3 position, Q14 and Q16 are turned on, turning on Q12 to route the VIDEO signal through R11 and to place R16 in parallel with R40 on the AST VF line. The .1, .03, .01, and .003 positions operate in the same way except that in the .003 position, only R40 is connected to the AST VF line.

The .003 position can also be activated by +15V routed through the FREQUENCY SPAN MODE switch when it is in the FULL BAND or the 1.7 — 22 GHz SPAN mode. In the NOISE AVG positions, Q39 is turned on, turning on Q37 to route the signal through R35.

The video bandwidth is further reduced by turning on Q26 and Q21, shunting the signal with C8. The AST BW-FS (Auto Sweep Time Bandwidth Frequency Span) line to the Sweep Generator Assembly, used to adjust the AUTO sweep time, is shunted to ground through R81.

Crystal-LC Bandwidth Select (B)

Either LC or crystal filtering is selected by routing +15V through five dc control lines (BW0 through BW4) from the front-panel RESOLUTION BW switch. Each of the lines BW1 through BW4 selects one of the crystal and one of the LC bandwidths. The BW0 line determines whether crystal or LC bandwidth filtering is selected. In the LC mode, a +15V is applied to the base of Q9, which turns on Q15 and turns off Q13, causing BW5 to reach about +14.8V. This enables only the LC bandwidths in the Bandwidth Filter No. 1 and No. 2 Assemblies. When BW0 is low, Q9 and Q15 are off and Q13 is on, causing BW5 to go to about −0.5V. This enables only the crystal bandwidths.

Crystal Bandwidth and Video Filter Capacitor Select (C)
LC Bandwidth and Video Filter Capacitor Select (D)

When 3 kHz BW (BW2) is selected, two actions take place. +15V is routed through the RESOLUTION BW switch to the base of Q7 and Q32. These two transistors turn on, turning on Q8 and Q36 and grounding one end of C2, C6, and R72. C2 (the effect of C6 is negligible) forms the capacitive portion of the RC lowpass Video Filter. The current through R72 is applied to the Sweep Generator Assembly for control of the AUTO sweep time. At the same time, BW0 is open, allowing BW5 to go low and turn off the LC section of the Bandwidth Filter No. 1 and No. 2 Assemblies. This also keeps Q38 and Q40 off, enabling the crystal bandwidths to be controlled individually. When Q7 and Q8 turn on, the PIN diode current in BW6 is set by the voltage source Q5 and R55. The 3 kHz BW ADJ R55 adjusts the 3 kHz resolution bandwidth to allow for PIN diode tolerances. When other crystal bandwidths are selected, other transistor pairs are turned on. This changes the PIN diode current in BW6, varies the AUTO sweep current in the AST BW-FS line, and selects the capacitors used in the video filter. In 1 kHz BW, the AUTO sweep time is set by the Sweep Generator Assembly.

When selecting the 300 kHz BW (BW2), +15V is applied to the BW0 line from the RESOLUTION BW switch. This drives the crystal or LC line (BW5) to about +14.8V, which partially disables the crystal section and allows use of the LC bandwidths. Q40 turns on, back-biasing CR14 and leaving the BW7 line free to control the LC bandwidths. Q38 also turns on, bringing BW6 low to turn the crystal bandwidths off and preventing Q2, Q7, Q10, and Q18 from being turned on. With Q2, Q7, Q10, and Q18 off, C1, C2, C3, and C4 cannot effect the video filter. BW0 also turns Q31 on, which changes the AUTO sweep time by adding the weighting resistor R67 to the AST BW-FS line. The +15V from the RESOLUTION BW switch (BW2 line) turns on Q32 and Q36, grounding R71, R72, and C6. The voltage source Q35 and R71 sets the PIN diode current for the 300 kHz BW and allows adjustment for PIN diode tolerances. The current through R72 and R67 fixes the AUTO sweep time, and C6 changes the amount of video filtering.

The selection of other LC bandwidths, with the RESOLUTION BW switch, turns on other transistor pairs. This changes the LC PIN diode current in BW7, varies the AUTO sweep current in AST BW-FS, and selects the capacitor used in the video filter. The negative voltage from Q33 ensures that none of the transistor pairs for the narrower bandwidths turns on, which keeps the large capacitors C1, C2, C3, and C4 from being connected to ground. C5, C6, C7 and stray capacitance in the 3 MHz BW become the video filter capacitors for the appropriate LC bandwidths. The resistors R71, R74, and R77 control the current for the proper LC bandwidth PIN diodes. In the 100 kHz resolution bandwidth (BW1), the sweep time is correct without switching in additional AUTO sweep control current, and the PIN diode current is preset in the Bandwidth Filter No. 1 and No. 2 Assemblies. The conduction of Q31 adds R67 to the AST BW-FS line to speed up the AUTO sweep time for the wider LC resolution bandwidths.

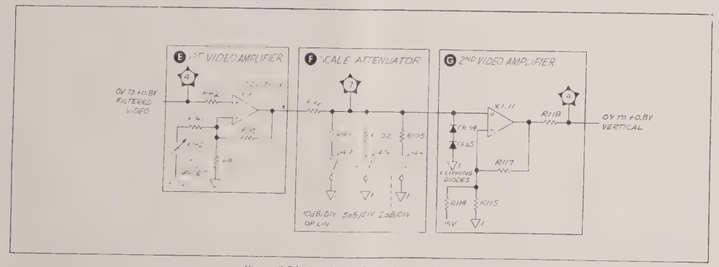

Figure 8-73. Amplitude Scale Control Circuitry

First Video Amplifier (E)

The detected and filtered video input (0V to +0.8V) is applied to the gate of Q43A. Q43, Q44, Q45, and Q46 make up a differential amplifier. The gate of Q43A is the non-inverting input and the gate of Q43B, the inverting input. The output at the emitter of Q46 is feedback applied to the gate of Q43B through a voltage divider consisting of R95 and the series-parallel combination of R91, R92, and R93. C16 and L3 change this voltage division at high frequencies to help increase the gain. The voltage gain of the amplifier is 9. +15V is applied to the OFFSET adjustment R92 to offset the input voltage by −0.8V so that the peak of the output signal is 0V. This minimizes any errors in the peak signal voltage that may be introduced by the Scale Attenuator. With an input voltage range of 0 to +0.8V, the signal at the emitter of Q46 will be −7.2V to 0V. Q42 and Q41 are current sources to bias the differential amplifier, and C17 is used to introduce negative feedback at high frequencies to prevent oscillation.

Scale Attenuator (F)

In 10 dB/DIV or LIN, +15V is routed through the front panel AMPLITUDE SCALE switch to the base of Q47, turning on Q47 and grounding one end of R99. R99 and R96 form a resistor divider which attenuates the output of the First Video Amplifier by about 1/10. This −0.72V to 0V signal is then applied to the input of the Second Video Amplifier.

In 5 dB/DIV, Q49 turns on and grounds R102, which attenuates the video signal by about 1/5. In 2 dB/DIV, R96 and R105 attenuate the signal by approximately 1/2, and in 1 dB/DIV the signal is not attenuated at all.

Second Video Amplifier (G)

The Second Video Amplifier functions in the same way as the First Video Amplifier, with Q50, Q51, Q52, and Q53 making up the differential amplifier. The gate of Q50A is the non-inverting input, and the gate of Q50B is the inverting input. The output of the Scale Attenuator is clipped at about −1.2V by CR34 and CR35 and then applied to the gate of Q50A. The output of the emitter of Q53 is feedback applied to the gate of Q50B through the voltage divider consisting of R117 and the parallel combination of R114 and R115. The voltage gain of the amplifier is 1.11. R114 is used to offset the input voltage by +0.72V to compensate for the negative offset in the First Video Amplifier. With an input voltage of −0.72V to 0V, the signal at the emitter of Q53 (and at TP8) would be 0V to +0.8V. Q54 is a current source to bias the differential amplifier, and C11 supplies negative feedback at high frequencies to prevent oscillation. R118, R121, R120, and R119 act to buffer the various outputs.

The FULL BAND frequency marker is generated by a negative voltage applied to R122 and R94 from the Full Multiband Assembly. This forwrd biases CR33, causing the vertical signal to the Y Deflection Amplifier Assembly to dip slightly (about −0.05V) at the tuned frequency.

A22 Log Amplifier Assembly
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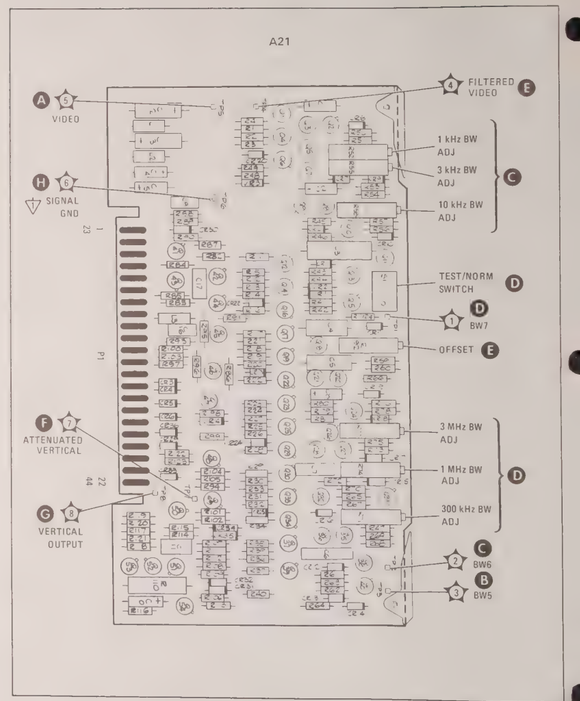
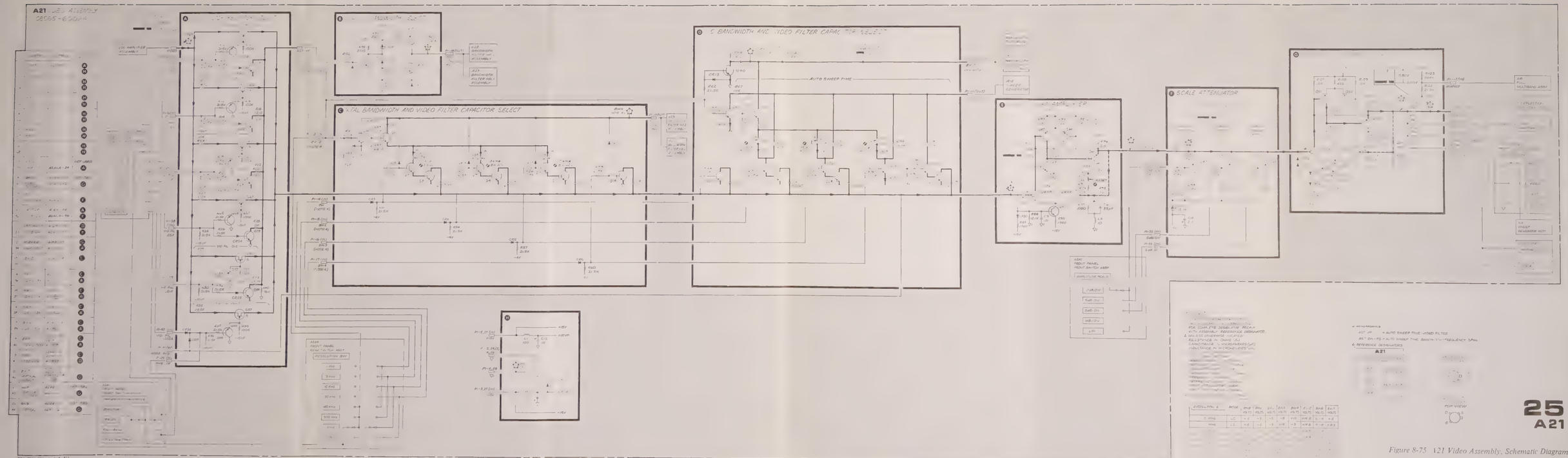


Figure 8-74. A21 Video Assembly, Component Locations



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A21

Figure 8-75 A21 Video Assembly, Schematic Diagram

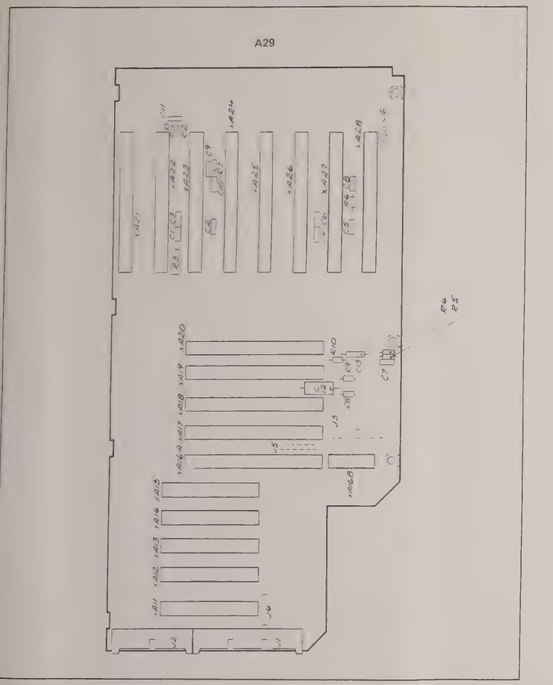

Figure 8-76. A29 RF-IF Motherboard, Component Locations

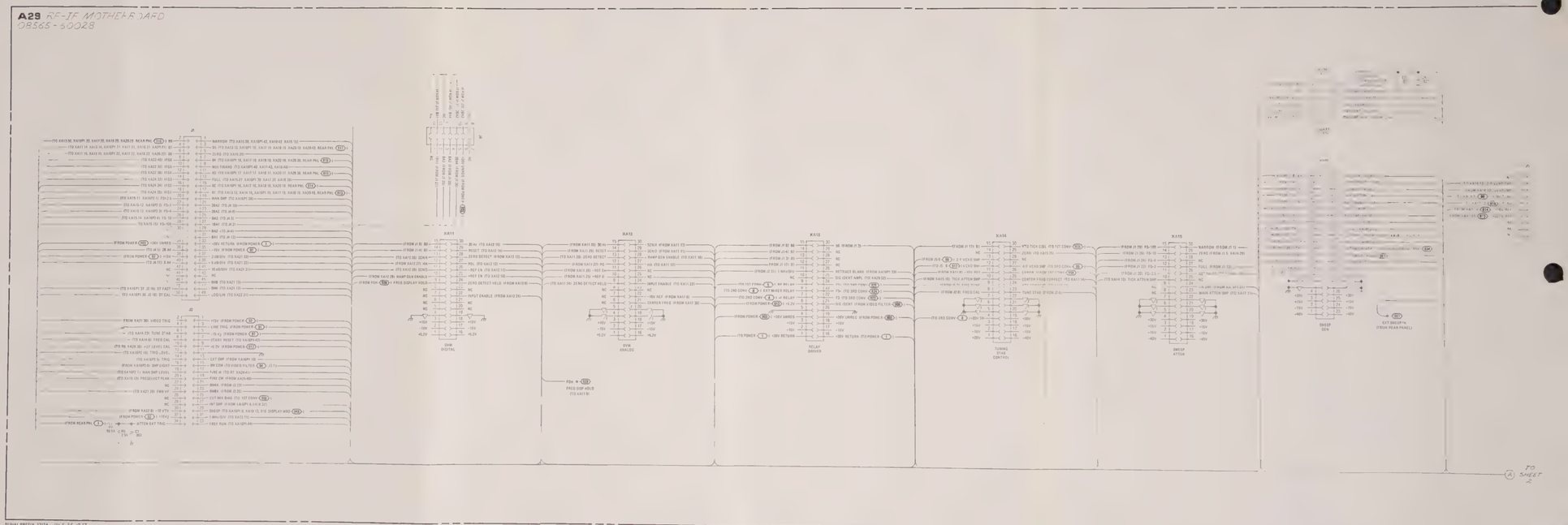

Figure 8-77. A29 RF-IF Motherboard, Schematic Diagram (1 of 2)

A21 Video Assembly
SERVICE SHEET 25

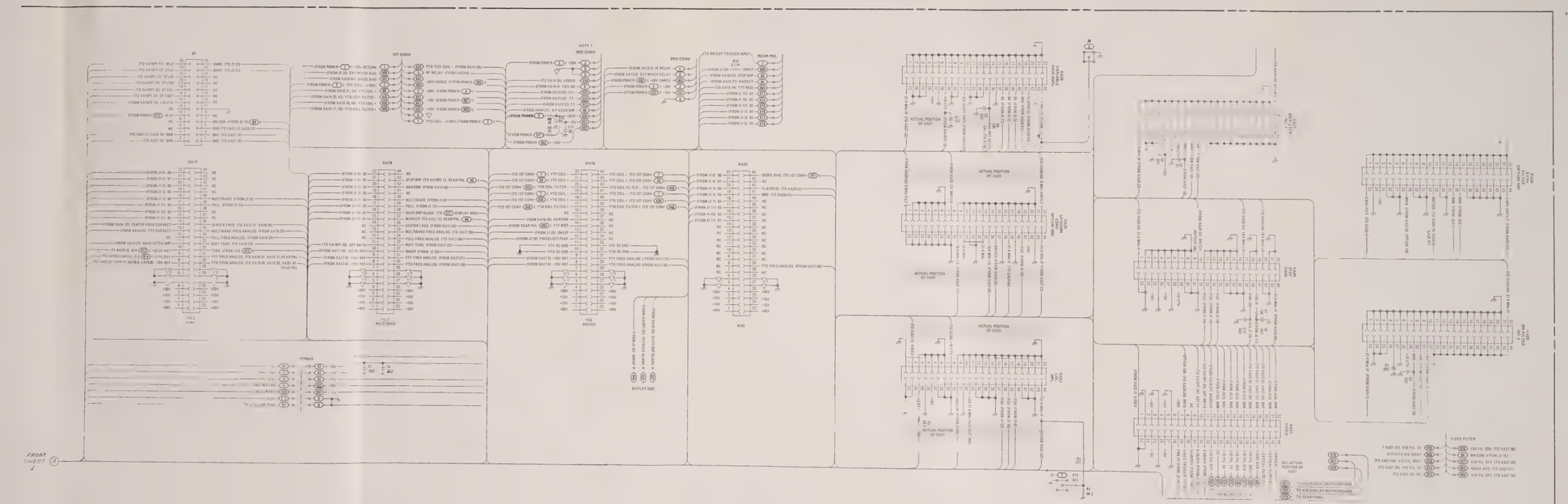

Figure 8-77. A29 RF-IF Motherboard, Schematic Diagram (2 of 2)

SERVICE SHEET 27

A1 FRONT PANEL DISPLAY ASSEMBLY, CIRCUIT DESCRIPTION

The Front Panel Display Assembly includes A1A1 Bezel Display Assembly and A1A2 Display Switch Assembly.

The Bezel Display Assembly provides information, in the form of LED displays above and below the CRT, about the front-panel control settings of the spectrum analyzer.

The Display Switch Assembly provides the switches and potentiometers affecting the CRT display.

A1A1 Bezel Display Assembly

The Bezel Display Assembly displays all major spectrum analyzer settings as readouts on the CRT bezel. The following information is displayed:

RES BW. Three seven-segment numeric displays and four annunciator LEDs (two individual and two in series) show resolution bandwidth in kHz or MHz.

REF LEVEL. Four numeric displays and two series annunciator LEDs show the net reference level derived from the settings of INPUT ATTEN, REF LEVEL dBm, and reference level FINE.

INPUT ATTEN. Two numeric displays and four series annunciator LEDS show input attenuation as dBm ATTN.

LOG SCALE. Two numeric displays and two series annunciator LEDS show AMPLITUDE SCALE in dB/ when a LOG/ DIV pushbutton is depressed. When LIN is depressed, two series annunciator LEDs light LIN in the upper left-hand corner of the bezel.

SWEEP TIME/DIV. Two numeric displays and four annunciator LEDs (two individual and two in series) show the sweep time per division in SEC/, mSEC/, or μSEC/. In AUTO, an A is displayed by lighting all but the "d" segment of one numeric display.

FREQUENCY. Six numeric displays and two series annunciator LEDs show the frequency in GHz that is displayed on the front panel as the FREQUENCY GHz readout.

FREQ SPAN/DIV. Three numeric displays and four annunciator LEDs (two individual and two in series) show the frequency span per division in kHz/or MHz/ when the PER DIV pushbutton is depressed. In 1.7 — 22 GHz SPAN or FULL BAND, or when FREQ SPAN/DIV is set to F, an F is displayed by lighting segments "a," "e," "f," and "g" of one numeric display. In ZERO SPAN, one numeric display shows a zero.

All inputs to the Bezel Display Assembly come from the Readout Driver Assembly. For information about the control of the bezel displays, refer to the circuit description for that assembly.

A1A2 Display Switch Assembly

The Display Switch Assembly includes five pushbutton switches and six potentiometers:

- ERASE
- WRITE
- CONV
- STORE
- SCALE
- FOCUS
- PERSIST
- INTENSITY
- STORE INTEN
- SCALE INTEN
- BASELINE CLIPPER

Refer to Section III for a description of the individual controls. References to these controls, as they apply to other assemblies, may be found in the circuit descriptions of A4 Z Axis Amplifier Assembly, A7 Storage Assembly, A8 High Voltage Power Supply Assembly, and A11 DVM Digital Assembly. See Table 8-2 for further information about the control lines related to the various modes of operation.

Table 8-3. A2A2 Display Switch Assembly Control Lines

MODE OF OPERATION / LINE	CONV	MODE	ERASE	SCALE BLANK	FREQUENCY DISPLAY HOLD
WRITE	LOGIC HIGH	LOGIC LOW	LOGIC LOW	LOGIC LOW	LOGIC LOW
CONV	LOGIC LOW	LOGIC HIGH	LOGIC LOW	LOGIC LOW	LOGIC LOW
STORE	LOGIC HIGH	LOGIC HIGH	LOGIC LOW	LOGIC LOW	LOGIC HIGH
SCALE	LOGIC HIGH	LOGIC LOW	LOGIC HIGH	LOGIC HIGH	LOGIC HIGH
ERASE (ENABLED IN WRITE MODE ONLY)	LOGIC HIGH	LOGIC LOW	LOGIC HIGH	LOGIC LOW	LOGIC LOW

The only control line not discussed in connection with other assemblies is FREQ DISPLAY HOLD. When either the STORE or the SCALE pushbutton is depressed, CR2 or CR3 conducts and charges C2. This causes CR4 to conduct and forces the FREQ DISPLAY HOLD line high to prevent updating of the frequency display data. When STORE or SCALE is released, C2 continues to prevent updating for a few hundred milliseconds. During CRT photography, this allows STORE and then SCALE to be depressed without a possible change in the frequency display.

A3 DISPLAY ADJUST ASSEMBLY, CIRCUIT DESCRIPTION

The Display Adjust Assembly includes the front-panel screwdriver adjustments ASTIG, TRACE ALIGN, HORIZ POSN, and VERT POSN.

The ASTIG adjustment A3R1 varies from −15V to +158V the potential on the rectangular astigmatism plate of the CRT, which is shown with A8 High Voltage Power Supply Assembly and A9 High Voltage Oscillator Assembly.

TRACE ALIGN adjustment A3R2 is discussed in the circuit description of A7 Storage Assembly; HORIZ POSN adjustment A3R3, A6 X Deflection Amplifier Assembly; and VERT POSN adjustment A3R4, A5 Y Deflection Amplifier Assembly.

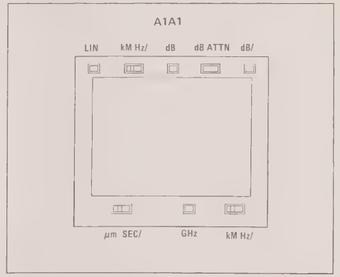

Figure 8-78. A1A1 Bezel Display Assembly, Nomenclature Diagram

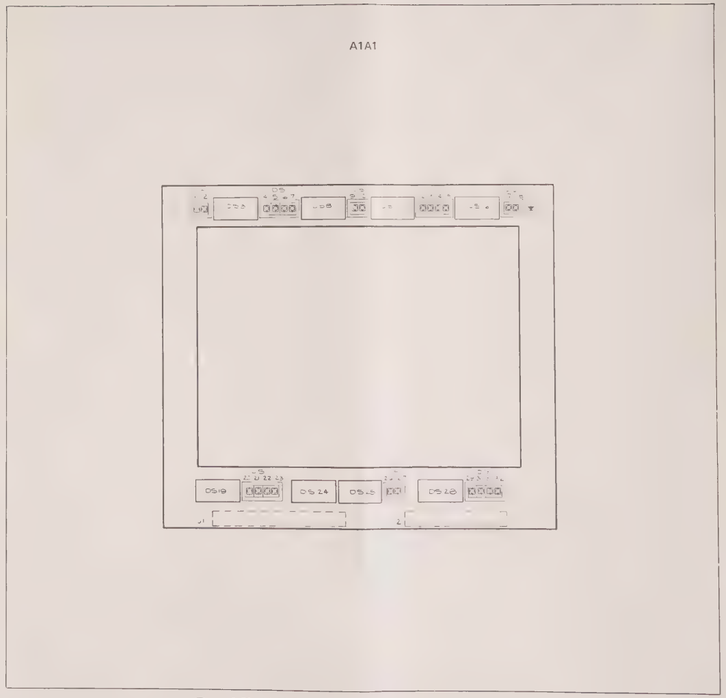

Figure 8-79. A1A1 Bezel Display Assembly, Component Locations

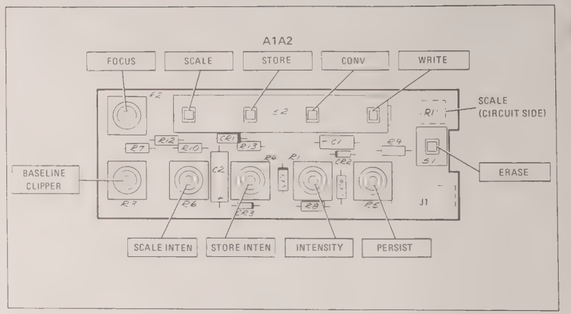

Figure 8-80. A1A2 Display Switch Assembly, Component Locations

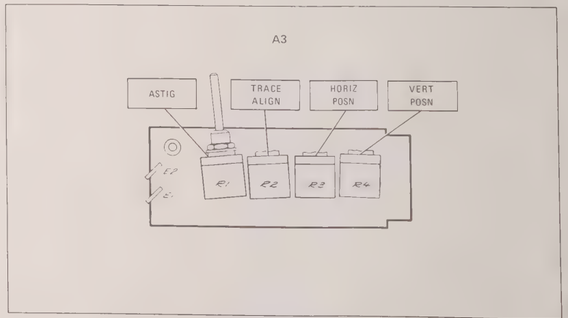

Figure 8-81. A3 Display Adjust Assembly, Component Locations

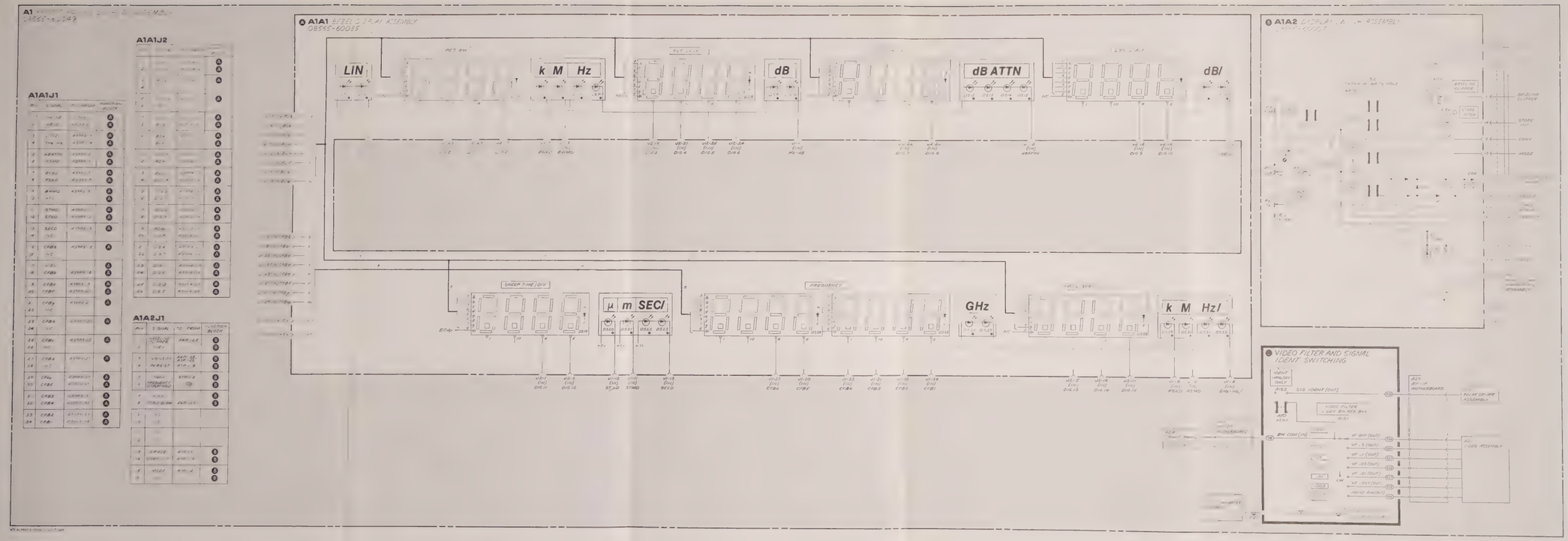

Figure 8-82. A1 Front Panel Display Assembly and A3 Display Adjust Assembly: Schematic Diagram

SERVICE SHEET 28
A6 X DEFLECTION AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION

The X Deflection Amplifier Assembly receives inputs from the front-panel HORIZ POSN adjustment and the Sweep Generator Assembly to provide a horizontal deflection signal to the CRT.

The X and Y Deflection Amplifier Assemblies are identical but with different interfaces. Although the same printed-circuit board is used in both assemblies, boards should not be interchanged unless both the display and the Video Assembly are to be recalibrated.

Voltage to Current Input Amplifier (A)

The Voltage to Current Input Amplifier has differential inputs but only one input is used. The input which is amplified is selected by the NORMALIZER CONTROL Line. When the normalizer is not connected or is in BYPASS mode of operation, the NORMALIZER CONTROL Line goes to +12V, turning FET Q17 on and FET Q16 off. When the normalizer is operating, it pulls the NORMALIZER CONTROL line to approximately −12V, turning Q17 off and Q16 on.

The nominal input voltage range is from 0V to 1V.

The GAIN adjustment R27 compensates for the different input voltage ranges for the X and Y Deflection Amplifier Assemblies. It also compensates for varying deflection factors for different CRTs. If R27 does not have enough range, the factory-selected resistor R26* may be changed. The HORIZ POSN adjustment on the Display Adjust Assembly controls the relative gain of the inverting and non-inverting sides of the amplifier. As the name implies, the Voltage to Current Input Amplifier has little voltage swing at the output (collectors of Q8 and Q13). It sinks varying amounts of current from Current to Voltage Output Driver Amplifiers "A" and "B," depending on the overall voltage required. However, the output voltage from the Voltage to Current Input Amplifier stays at about 0V. Q8, Q9, and Q10 on one side, and Q13, Q14, and Q15 on the other side, act as common emitter amplifiers, with the last stage (Q8 and Q13) having a voltage gain of zero.

Current to Voltage Output Driver Amplifier "A" (B) and Current to Voltage Output Driver Amplifier "B" (C)

These two amplifiers are identical. Amplifier "A" is driven by the inverting output of the Voltage to Current Input Amplifier, and Amplifier "B" is driven by its non-inverting output. Amplifiers "A" and "B" are both inverting amplifiers. Only Amplifier "A" will be described.

Emitter follower Q7 is ac coupled and helps boost the high-frequency performance of the circuit. It can be ignored unless only the high frequency operation of the assembly is operating improperly.

A1 Front Panel Display Assembly
A3 Display Adjust Assembly
◀ SERVICE SHEET 27

Assume that the input to Amplifier "A" is open and all the transistors have infinite beta; i.e., their base currents are zero. The base voltage of Q2 is approximately 0.6V,and the base voltage of Q1 is determined by R33 and R35 to be approximately 148V. This sets the collector current of Q1 to about 7 mA. The collector current of Q2 is also about 7 mA because if any of the current is shunted into the base of Q5, the voltage on the emitter of Q5 increases and Q2 is turned on sufficiently to sink 7 mA.

Now assume that the input of Amplifier "A" is connected to the output of the Voltage to Current Input Amplifier. Whatever amount of current is sunk by the input amplifier must be supplied by Q1 through R29. For every milliamp of current sunk by the input amplifier, the output voltage rises 19.6V to keep the input voltage of Amplifier "A" near 0V. The whole assembly has a voltage gain of about 100.

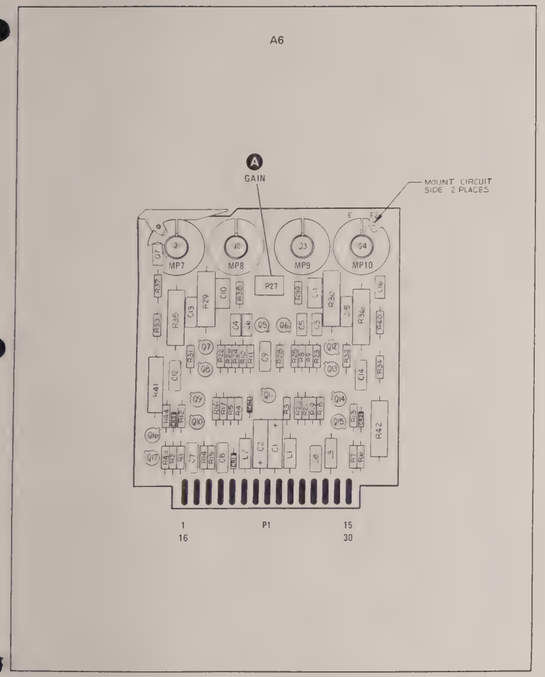

Figure 8-83. A6 X Deflection Amplifier Assembly, Component Locations

Figure 8-84. A6 X-Deflection Amplifier Assembly, Schematic Diagram

SERVICE SHEET 29
A5 Y DEFLECTION AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION

The Y Deflection Amplifier Assembly receives inputs from the front-panel VERT POSN adjustment, the Video Assembly, and the Storage Assembly to provide a vertical deflection signal to the CRT.

The X and Y Deflection Amplifier Assemblies are identical but with different interfaces. Although the same printed-circuit board is used in both assemblies, boards should not be interchanged unless both the display and the Video Assembly are to be recalibrated.

Voltage to Current Input Amplifier (A)

The Voltage to Current Input Amplifier has differential inputs but only one input is used except in the STORE mode of operation, when the BEAM DEFLECT line to the Y Deflection Amplifier goes high. The input which is amplified is selected by the NORMALIZER CONTROL line. When the normalizer is not connected or is in BYPASS mode of operation, the NORMALIZER CONTROL Line goes to +12V, turning FET Q17 on and FET Q16 off. When the normalizer is operating, it pulls the NORMALIZER CONTROL line to approximately −12V, turning Q17 off and Q16 on.

The nominal input voltage range is from 0V to 0.8V.

The GAIN adjustment R27 compensates for the different input voltage ranges for the X and Y Deflection Amplifier Assemblies. It also compensates for varying deflection factors for different CRTs. If R27 does not have enough range, the factory-selected resistor R26* may be changed. The VERT POSN adjustment on the Display Adjust Assembly controls the relative gain of the inverting and non-inverting sides of the amplifier. As the name implies, the Voltage to Current Input Amplifier has little voltage swing at the output (collectors of Q8 and Q13). It sinks varying amounts of current from Current to Voltage Output Driver Amplifiers "A" and "B", depending on the overall voltage required. However, the output voltage from the Voltage to Current Input Amplifier stays at about 0V. Q8, Q9, and Q10 on one side, and Q13, Q14, and Q15 on the other side, act as common emitter amplifiers, with the last stage (Q8 and Q13) having a voltage gain of zero.

Current to Voltage Output Driver Amplifier "A" (B) and Current to Voltage Output Driver Amplifier "B" (C)

These two amplifiers are identical. Amplifier "A" is driven by the inverting output of the Voltage to Current Input Amplifier, and Amplifier "B" is driven by its non-inverting output. Amplifiers "A" and "B" are both inverting amplifiers. Only Amplifier "A" will be described.

A6 X Deflection Amplifier Assembly
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Emitter follower Q7 is ac coupled and helps boost the high-frequency performance of the circuit. It can be ignored unless only the high frequency operation of the assembly is operating improperly.

Assume that the input to Amplifier "A" is open and all the transistors have infinite beta; i.e., their base currents are zero. The base voltage of Q2 is approximately 0.6V, and the base voltage of Q1 is determined by R33 and R35 to be approximately 148V. This sets the collector current of Q1 to about 7 mA. The collector current of Q2 is also about 7 mA because if any of the current is shunted into the base of Q5, the voltage on the emitter of Q5 increases and Q2 is turned on sufficiently to sink 7 mA.

Now assume that the input of Amplifier "A" is connected to the output of the Voltage to Current Input Amplifier. Whatever amount of current is sunk by the input amplifier must be supplied by Q1 through R29. For every milliamp of current sunk by the input amplifier, the output voltage rises 19.6V to keep the input voltage of Amplifier "A" near 0V. The whole assembly has a voltage gain of about 100.

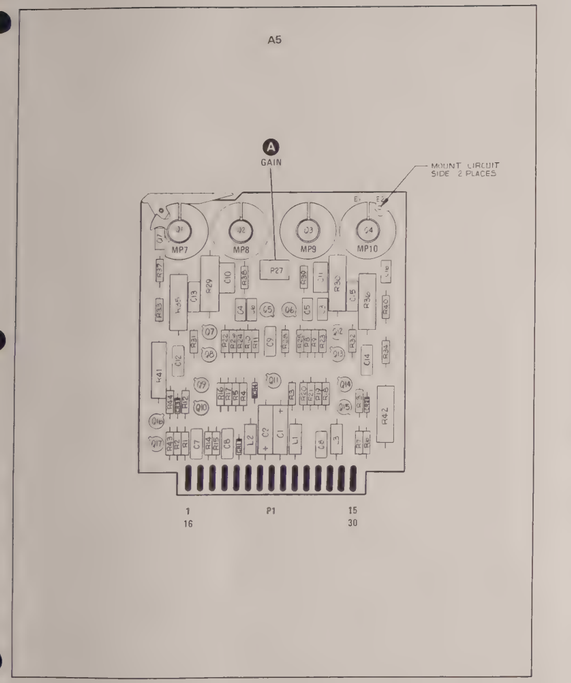
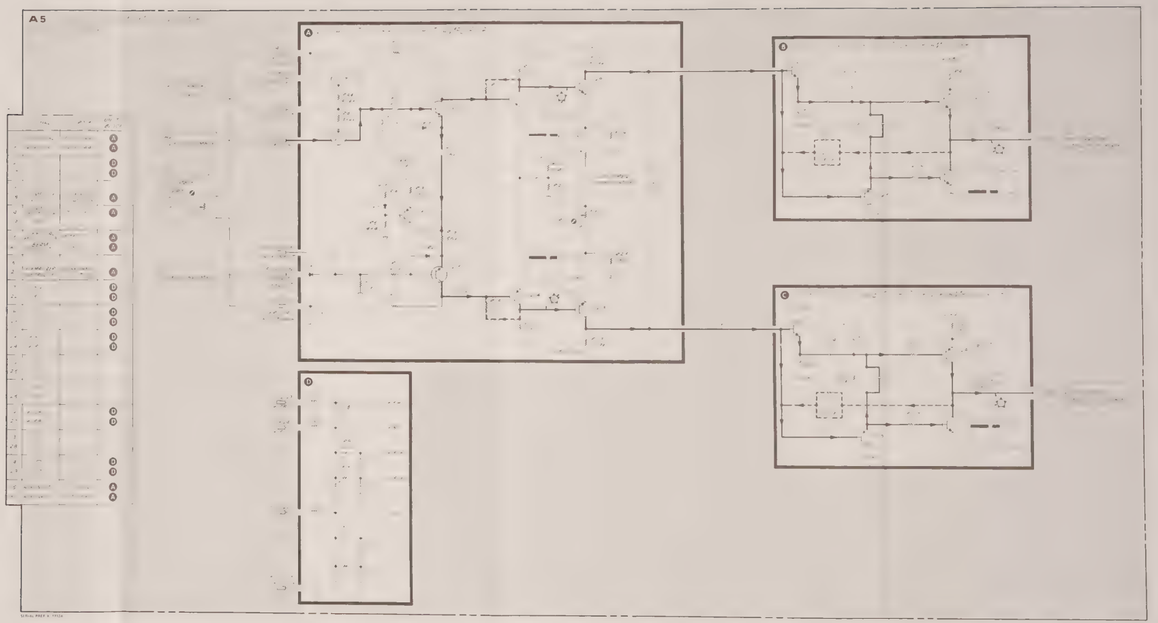
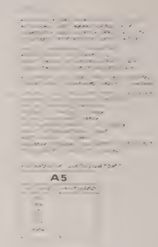


Figure 8-85. A5 Y Deflection Amplifier Assembly, Component Locations





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A5

Figure 8-86. A5 Y-Deflection Amplifier Assembly, Schematic Diagram

SERVICE SHEET 30
A4 Z AXIS AMPLIFIER ASSEMBLY, CIRCUIT DESCRIPTION

The Z Axis Amplifier Assembly performs all CRT blanking functions. It consists of five major circuits: CRT Blanking Logic, Penlift Driver, Vertical Baseline Clipper, Intensity Control, and Z Axis Driver.

CRT Blanking Logic (A)

The CRT Blanking Logic circuit ORs the blanking inputs that ultimately control the blanking signal to the CRT and the BLANK OUTPUT (PEN LIFT) signal to the rear panel. When the NORMALIZER CONTROL IN input is high (i.e., the 8750A Normalizer is not used) the CRT can be blanked by one of the following inputs: RETRACE BLANK, OVER SWP BLANK, STORE BLANK, SCALE BLANK, or BLANKING INPUT. In normal operation the blanking is provided by RETRACE BLANK from the Sweep Generator Assembly and sometimes by OVER SWP BLANK, as well, from the Full Multiband Assembly. The RETRACE BLANK command drives the outputs of U2C low, U2D high, and U1A and U1B high. The high input to the Z Axis Driver blanks the CRT by revrse biasing CR8, preventing current flow from the input of the Z Axis Driver.

One exception to this normal logic flow is the rear-panel BLANKING INPUT signal. This is a blanking signal which is ORed in with the normal logic flow and enables blanking from logic levels supplied to the rear panel. Entering at P1 pin 17, the BLANKING INPUT drives Q3 low. The outputs of U3B, U1D, U1A, and U1B are all driven high. Again, a high output from U1B blanks the CRT.

A STORE BLANK signal from the Storage Assembly or a SCALE BLANK signal from the Display Switch Assembly can supply a blanking signal to the Z Axis Driver through U1C, U1D, U1A, and U1B. These inputs are ORed with the rear-panel BLANKING INPUT signal at U1D.

Another input to the CRT Blanking Logic is the OVER SWP BLANK signal from the Full Multiband Assembly. This signal blanks the CRT whenever the instrument is swept outside its normal frequency limits. OVER SWP BLANK is NORed with RETRACE BLANK at U2C.

When the spectrum analyzer is used with the 8750A Normalizer, the normalizer takes over the blanking functions that would normally be performed by RETRACE BLANK or OVER SWP BLANK. The NORMALIZER CONTROL IN signal is applied to U2A and U2B. An active low input disables RETRACE BLANK and OVER SWP BLANK by driving the output of U2D low. It also enables the NORMALIZER BLANK IN signal by a low input at U2B. The NORMALIZER BLANK IN signal is then inverted by U3A, reinverted by U2B, and then ORed by U1B with a low from U1A (the disabled RETRACE BLANK and OVER SWP BLANK signal) to provide a blanking input to the Z Axis Driver.

A5 Y Deflection Amplifier Assembly
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Penlift Driver (B)

The output of U2C goes to the Penlift Driver circuit to drive Q11, which performs the PEN LIFT (external blanking out function of the rear panel of the instrument. A low output from U2C gives a "true" PEN LIFT output from Q11.

Vertical Baseline Clipper (C)

The Vertical Baseline Clipper circuit compares the VERTICAL CLIPPER signal from the Video Assembly with the 0V to +0.9V BASELINE CLIPPER signal from the Display Switch Assembly. In the normal mode (BASELINE CLIPPER OFF at full ccw position), Q9 is biased on and Q8 is turned off. However, when the BASELINE CLIPPER signal is such that it biases Q9 off, the VERTICAL CLIPPER signal controls the switching point of Q8 and Q9. In this case, when the VERTICAL CLIPPER VOLTAGE EXCEEDS THE BASELINE CLIPPER voltge, Q8 returns to the normal off state, turning Q9 on. The output of this comparator is applied to the INTENSITY Control switches Q6 and Q7.

Intensity Control (D)

Under normal operation, in which Q6 is off and Q7 is on, the current from the current source Q10 flows through Q7 out of the input to the Z Axis Driver, forming an unblanking signal. Under these conditions, the amount of current flowing in the collector of Q10 controls the beam intensity of the CRT. This current is adjusted by the INTENSITY signal from the Display Switch Assembly (front-panel INTENSITY control).

When the signal out of the Vertical Baseline Clipper is high, Q9 is off and Q8 is on, Q6 turns on, Q7 turns off, thus shunting the current from the collector of Q10 to the +15V supply. This stops current flow from the Z Axis Driver which blanks the display.

Z Axis Driver (E)

The Z Axis Driver circuit is a current amplifier used to drive the blanking gate of the High Voltage Power Supply Assembly for the CRT. When current flows out of the input of the Z Axis Driver, it turns on Q4, which then turns on Q1, applying a positive GATE signal to the High Voltge Power Supply Assembly to unblank the CRT. When a BLANKING signal from the CRT Blanking Logic circuit is applied to the input of the Z Axis Driver, Q5 and Q2 turn on, applying a zero GATE signal to the High Voltage Power Supply Assembly, blanking the CRT. The amplifier is stabilized by both ac and dc feedback. R22 supplies the dc feedback and HF ADJUST C8, the high frequency feedback. C8 acts in conjunction with C6 and R18 (HF GAIN) to set the high frequency response of the amplifier.

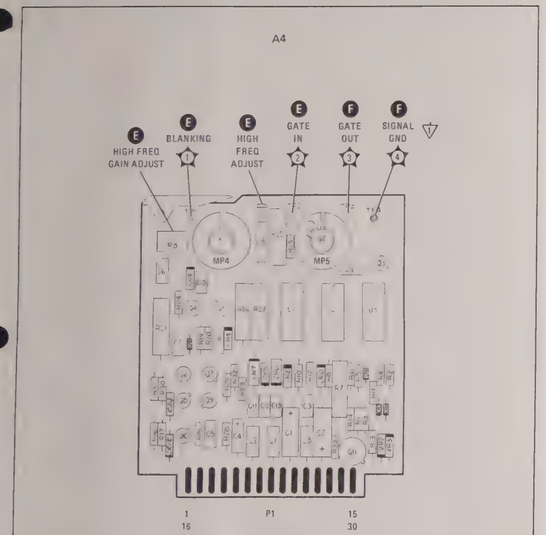

Figure 8-87. Z-Axis Amplifier Assembly, Component Locations

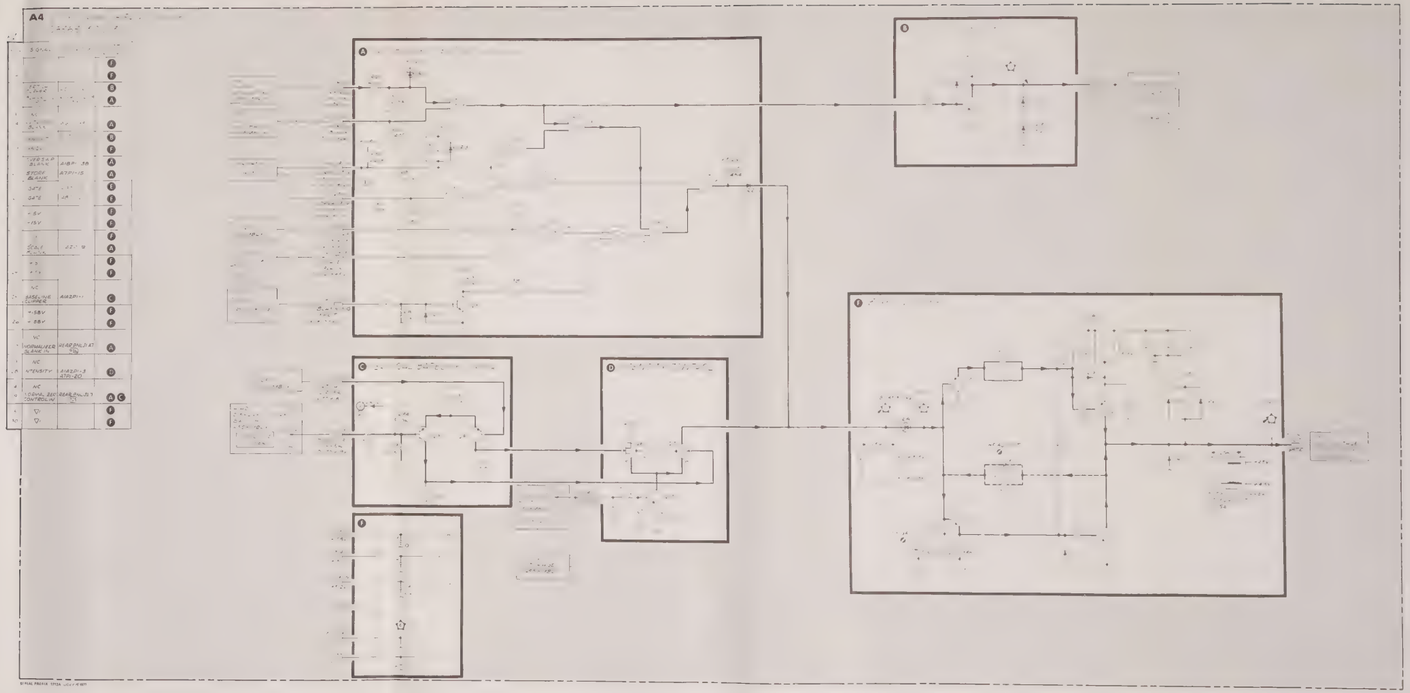

Figure 8-88. A4 Z-Axis Amplifier Assembly, Schematic Diagram

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A7 STORAGE ASSEMBLY, CIRCUIT DESCRIPTION

The Storage Assembly controls the storage portions of the CRT and in addition controls orthogonality and pattern. It also contains circuitry which controls the interaction between the PERSIST and INTENSITY potentiometers.

The CRT contains the conventional electron (writing) gun, deflection plates, post-accelerator, and phosphor screen. In addition, there are two flood guns, a collimator, a collector mesh, and a storage mesh. These added elements make possible the variable persistence and storage functions of the instrument.

The Display Truth Table on the schematic is a useful troubleshooting tool to determine whether a malfunction is in the Storage Assembly or in the CRT.

In WRITE mode the storage circuits must apply: (1) the calibrated collimator voltage, (2) an unblanking voltage to the Z Axis Amplifier Assembly, (3) a dc flood gun accelerator voltage, and (4) variable persistence duty-cycle erase pulses to the storage mesh. The duty cycle of the pulse train is changed by varying the pulse frequency. Pulse frequency is changed by varying the pulse generator input current. Pulse generator input current is supplied from the PERSIST potentiometer.

SCALE mode is the same as WRITE mode except that the display is automatically blanked and erased, and the SCALE INTEN pot takes the place of the PERSIST pot. SCALE mode is used to provide the proper graticule illumination for photographing the display using the double-exposure method.

In STORE mode the storage circuits must apply: (1) the calibrated collimator voltage, (2) a blanking voltage to the Z Axis Amplifier Assembly, (3) a deflection voltage to one side of the Y-amplifier, (4) adjustable duty cycle pulses to the flood gun accelerator, and (5) a dc voltage to the storage mesh. The pulse generator input current is adjusted by varying the current with the STORE INTEN pot.

Depressing the ERASE pushbutton initiates the erase cycle, during which the storage circuits must apply: (1) a modulated 500-millisecond blanking pulse to the Z Axis Amplifier Assembly, (3) a 500-millisecond deflection pulse to one side of the Y-amplifier, (4) a dc flood gun accelerator voltage, and (5) a 500-millisecond complex waveform to the storage mesh. Before and after the erase cycle, the pulse circuits are in the WRITE mode. During the erase cycle, the output of the pulse generator is inhibited, and the waveform to the storage mesh is controlled by the output of the erase cycle timing switch.

Display Function Decoding Logic (A)

The Display Function Decoding Logic circuit monitors the three logic control lines from the Display Switch Assembly and controls the other circuits on the Storage Assembly. (The Display Truth Table describes these logic control lines.) This circuit also selects the current that controls the duty cycle of the Persistence Pulse Generator. Either the SCALE INTENSITY line or the PERSISTENCE line from the Display Switch Assembly is selected, or they are both disabled, depending on which display mode is selected.

Intensity Vs Persistence Control (B)

This circuit monitors the PERSISTENCE control line and modulates the INTENSITY line to prevent the display from dimming when the persistence is decreased.

Orthogonality Adjust (C)

The ORTHOG adjustment R71 controls the amount of current through the orthogonality coil. The coil is placed in such a position that it affects horizontally deflected electrons more than it affects vertically deflected electrons. This assures that the horizontal deflection plates operate on the electron beam perpendicular to the angle at which the vertical deflection plates operate. The trace align coil operates equally on both vertically and horizontally deflected electrons. The TRACE ALIGN adjustment is in the Display Adjust Assembly.

Flood Gun Heater Interlock (D)

The Flood Gun Heater Interlock drops the −15V to approximately −12.6V to be used for the flood gun filament. It also disables the flood guns if the Storage Assembly is removed. Note that the +158V to the High Voltage Oscillator Assembly is also interlocked and disables the writing gun filament voltage and the high voltage for the CRT if the Storage Assembly is removed, but do not rely on this feature. Turn the instrument off before removing this or other assemblies.

Persistence Pulse Generator (E)

The Persistence Pulse Generator is a variable duty cycle, astable multivibrator. The fixed pulse width is set by R5 and C6. The pulse repetition frequency is set by the current through Q2. (See the Display Truth Table.)

Storage Pulse Generator (F)

The Storage Pulse Generator is an astable multivibrator. The pulse width and pulse repetition frequency are set by R34, R35, and C13. (See the Display Truth Table.)

CRT Blanking (G)

The CRT Blanking circuit blanks the CRT in STORE mode and for the duration of the erase cycle. The BEAM DEFLECT line simultaneously goes high to saturate the Y Deflection Amplifier at its negative limit. This will prevent any electrons that may still escape from the writing gun from reaching the storage mesh, which would degrade store time.

Mesh Driver (H)

The Mesh Driver circuit controls the STORAGE MESH and COLLECTOR MESH potentials, which vary for different modes, persistence settings, and store times. (See the Display Truth Table.)

The collector mesh is between the flood guns and the storage mesh (closer to the storage mesh). It is always positive with respect to the storage mesh except in the ERASE mode of operation; both are then at the same potential. In addition to accelerating flood gun electrons, the collector mesh also repels positive ions generated by the flood guns.

The storage mesh is just behind the CRT screen and is coated with non-conducting material. It is statically held at a slightly positive potential (approximately +3V). When the electron beam from the writing gun strikes the mesh coating, secondary electrons are emitted. This secondary emission creates a pattern of positive potential identical to the movement of the beam. Flood gun electrons are accelerated by this positive potential pattern and strike the phosphor screen, creating a visible display.

The storage mesh is pulsed with pulses of approximately 10 microseconds duration. These pulses erase the positive pattern on the storage mesh by discharging the mesh coating. The time required for this erasing operation is determined by the pulse repetition rate. The positive pattern on the mesh also may be neutralized manually by connecting the collector and storage meshes (ERASE). The high positive potential (approximately +156V) allows more uniform discharging of the surface. When the storage mesh is disconnected from the collector mesh and returned to +3V, the coated surface is at a uniform potential of −9V. In both cases, the screen has no illumination. The pattern is lost if the storage mesh fades positive, allowing the entire screen to be illuminated. This occurs when positive ions from the flood gun raise the surface potential of the storage mesh in random areas sufficiently to allow flood gun electrons to strike the screen.

Flood Gun Accelerator Driver (I)

Two flood guns, located just outside the horizontal deflection plates of the CRT, operate continuously when the power switch is on. An electron cloud, which is emitted by the flood guns, is accelerated toward the CRT screen by the COLLIMATOR and COLLECTOR MESH voltages. These electrons make stored or persisting displays visible. They are also used to erase stored and persisting displays.

The Flood Gun Accelerator Driver output transistors Q14 and Q15 are emitter followers that provide a low output impedance so that the flood gun accelerators can be switched quickly. (See the Display Truth Table.)

Collimator Driver (L)

The collimator is an internal coating along the tapered portion of the CRT. A positive voltage applied to the collimator focuses the flood-gun electrons. The flood-gun electrons are formed into a column perpendicular to, and approximately equal to, the width of the CRT screen.

The COLLIMATOR adjustment R64 is set so that the beam of the flood-gun electrons covers all but possibly one of the corners of the CRT screen.

Flood Gun Grid Driver (J)

The flood gun grids stay at a fixed potential independent of the display mode. (See the Display Table.) The FLOOD GUN GRID voltage is set by FLG adjustment R63 for the best combination of brightness and uniformity of the background in WRITE mode.

Pattern Adjust (K)

PAT pot R59 corrects for changes in the deflection factor of the CRT as a function of position of the electron beam. The two extremes of pattern maladjustment would appear as is shown below if one attempted to draw a square using the electron beam:

A4 Z-Axis Amplifier Assembly
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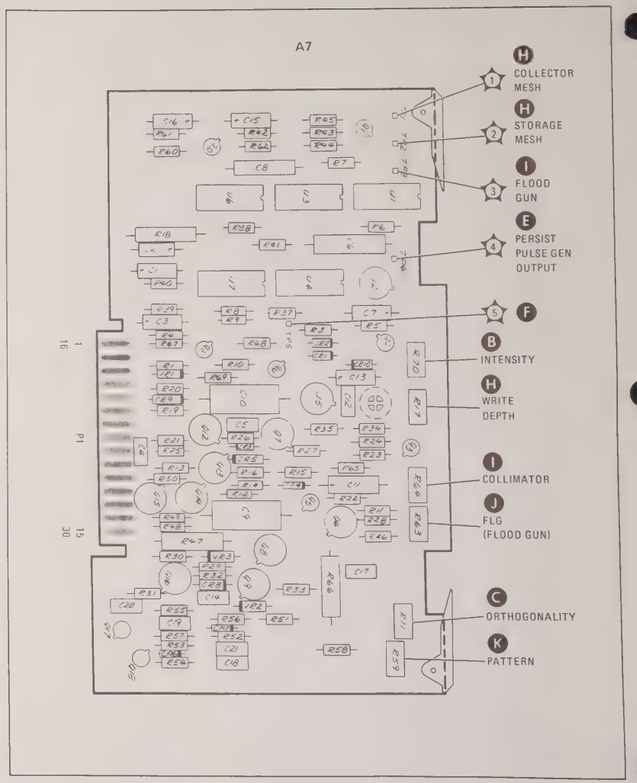
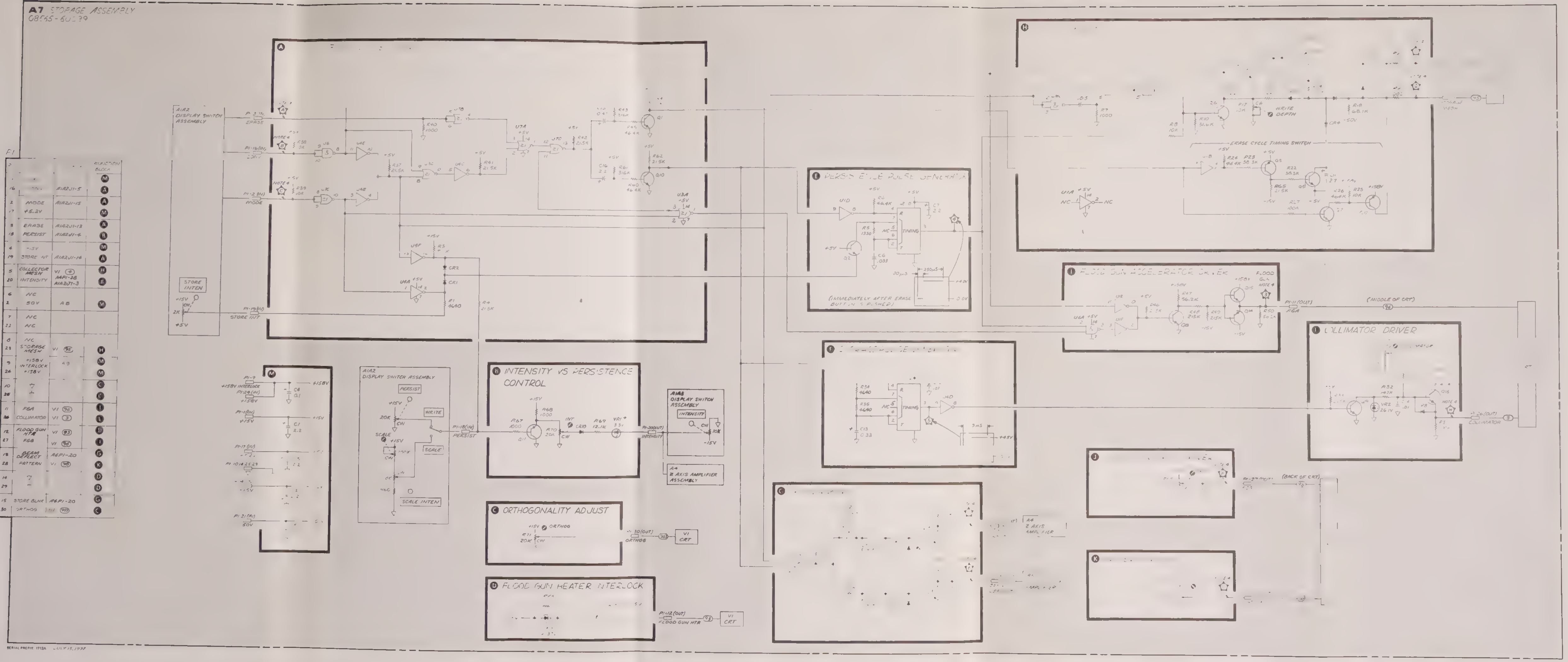


Figure 8-89. A7 Storage Assembly, Component Locations



HENRIES (μH)

...RY SELECTED ... S SHOWN

... OF OPERATION	B	MODE C	ERASE A	COLLIMATOR	STORAGE MESH	BEAM DEFLECT	STORE BLANK	SCALE BLANK*	FLOOD GUN ACCELERATOR	FREQUENCY DISPLAY HOLD	NORMALIZER CONTROL LINE
WRITE	LOGIC HIGH	LOGIC LOW	LOGIC LOW	APPROXIMATELY 40v TO 90V ADJUSTABLE BY "COLLIMATOR" POT A7R64	PERSISTENCE PULSES 30μSEC HEIGHT SET BY "WRITE DEPTH" POT A7R17 (0 TO 10V) DUTY CYCLE SET BY FRONT PANEL PERSIST	LOGIC LOW		LOGIC LOW	60V ± 5V NO ADJUSTMENT	LOGIC LOW	≥10 VOLTS NORMALIZER NOT CONNECTED; ≥10 VOLTS NORMALIZER CONNECTED BUT NOT NORMALIZING; ≤-10VOLTS NORMALIZER CONNECTED AND NORMALIZING
CONV	LOGIC LOW	LOGIC HIGH	LOGIC LOW	SAME AS WRITE MODE	-50V	LOGIC LOW		LOGIC LOW	SAME AS WRITE MODE	LOGIC LOW	
STORE	LOGIC HIGH	LOGIC HIGH	LOGIC LOW	SAME AS WRITE MODE	APPROXIMATELY +3.5 VOLTS	LOGIC HIGH		LOGIC LOW	STORAGE PULSES 30μSEC +58V -8V DUTY CYCLE SET BY STORE INTEN	LOGIC HIGH	
SCALE	LOGIC HIGH	LOGIC LOW	LOGIC HIGH	SAME AS WRITE MODE	SAME AS WRITE MODE EXCEPT DUTY SET BY FRONT PANEL SCALE INTEN	LOGIC LOW		LOGIC HIGH	SAME AS WRITE MODE	LOGIC HIGH	
ERASE (ENABLED IN WRITE MODE ONLY)	LOGIC HIGH	LOGIC LOW	LOGIC HIGH	3mSEC 10V SUPERIMPOSED ON DC LEVEL	100mSEC +158V PERSISTENCE PULSES 0V +15V 0.5 SEC	LOGIC HIGH FOR DURATION OF ERASE CYCLE		LOGIC LOW	SAME AS WRITE MODE	LOGIC LOW	

FIXED VOLTAGES:

FLOOD GUN GRID	0 TO -50V ADJUSTABLE BY A7R63
ASTIGMATISM	-15V TO +158V ADJUSTABLE BY ASTIG
PATTERN	0 TO 100V ADJUSTABLE BY A7R58
WRITE GUN ACC	+68V ± 5V
... HTR	...
... MESH	+158V

LOGIC HIGH: GREATER THAN 2.0V; LESS THAN 5.25V
LOGIC LOW: GREATER THAN 0V; LESS THAN 0.8V
* INPUT TO A4 Z-AXIS AMPLIFIER; SEE SERVICE SHEET 30

5. REFERENCE DESIGNATORS

A7

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A7

Figure 8-90. A7 Storage Assembly, Schematic Diagram

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A8 HIGH VOLTAGE POWER SUPPLY ASSEMBLY, CIRCUIT DESCRIPTION

WARNING

Because of the high voltages found in this assembly, servicing should be accomplished only by qualified personnel.

The High Voltage Power Supply Assembly provides operating potentials for the CRT. These include −3000V for the cathode, approximately −3050V for the intensity grid, +7000V for the post accelerator (by way of High Voltage Multiplier U1), −50V for CRT controls, and approximately −2000V for focus.

Intensity Clamp (G)

The control grid voltage must be more negative than the cathode voltage to limit the density (intensity) of the electron beam. The control grid voltage is determined by both the gate voltage from the Z Axis Amplifier Assembly and the INTENSITY LIMIT pot in the High Voltage Oscillator Assembly. The Intensity Clamp limits the voltage from T1 (appearing at TP2), rectifies the voltage, and adds it to the cathode voltage to develop the control grid voltage.

−50V Power Supply (J)

The −50V Power Supply is needed in the Storage Assembly to set the flood gun grid voltage and is used in the ERASE cycle.

Focus Limit (H)

The FOCUS LIMIT adjustment R13 is in series with the FOCUS control on the display front panel. R13 should be adjusted so that optimum focusing is attained with the FOCUS control near mid-position.

A9 HIGH VOLTAGE OSCILLATOR ASSEMBLY, CIRCUIT DESCRIPTION

The High Voltage Oscillator Assembly senses the CRT cathode voltage and varies the average base current of Q1 to maintain the cathode at −3000V.

Intensity Limit (A)

The INT LIMIT ADJ potentiometer R1 acts with the Intensity Clamp circuit in the High Voltage Power Supply Assembly to determine the CRT control grid voltage.

+26V Filter (B)

This filter serves two purposes. First, it prevents the 40 kHz from the transformer from being superimposed on the power supplies. This is accomplished by the filter C9, L1, L3 and C1. Second, it prevents the 120 Hz on the +26V UNREG line from modulating the transformer current. C10, Q2, and Q3 accomplish this.

Oscillator Driver and Oscillator Bias Current Regulator (C) (D)

When line power is applied to the instrument, approximately +26V is applied to Q1 in the Oscillator Driver and the primary of transformer A8T1. Current is drawn through Q1 and the transformer primary producing a magnetic field. This field is coupled back to the base of Q1, and Q1 draws more current, producing a stronger field and feedback to the base of Q1. This continues until the transformer core saturates, then Q1 draws less current, and the field collapses. The collapsing field is fed back to the base of Q1 as a turn-off signal, causing oscillations at about 40 kHz.

A sample of the CRT cathode voltage is fed back through the High Voltage Feedback circuit into the Oscillator Bias Current Regulator, where it is compared with a reference voltage from the interlocked +158V. Any difference is amplified by U1. The amplified difference drives the base of Q1 to correct the error and maintain the proper average base current for Q1. U1 does not switch at a 40 kHz rate.

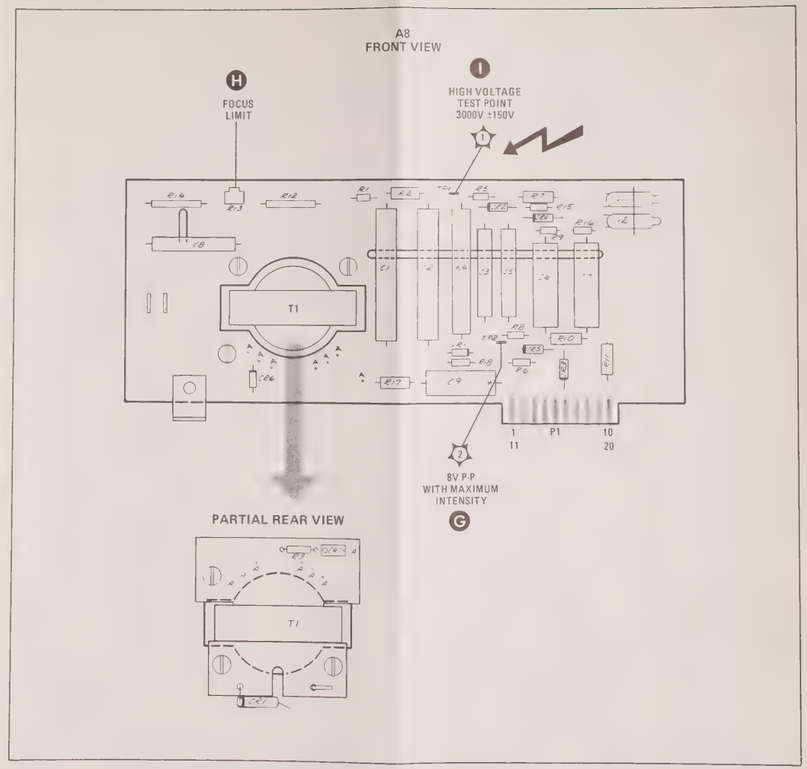

Figure 8-91. A8 High Voltage Power Supply Assembly, Component Locations

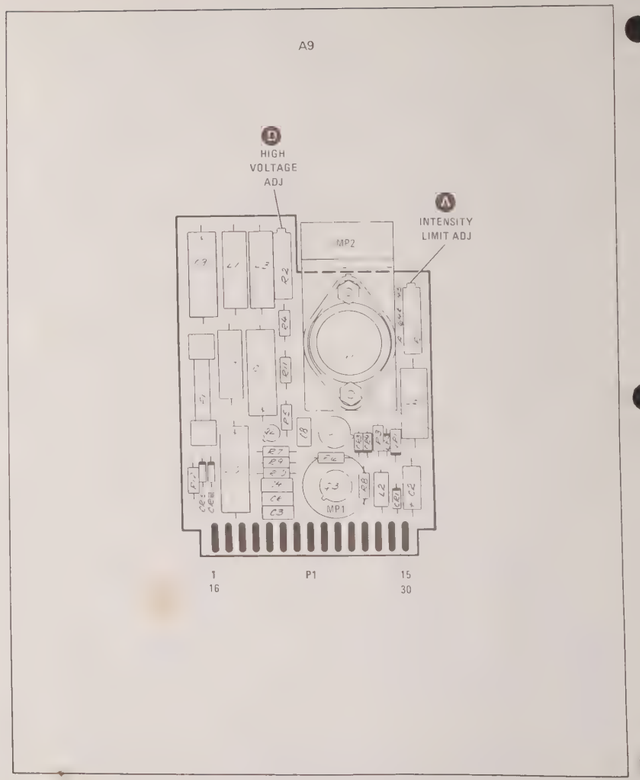

Figure 8-92. A9 High Voltage Oscillator Assembly, Component Locations

A7 Storage Assembly
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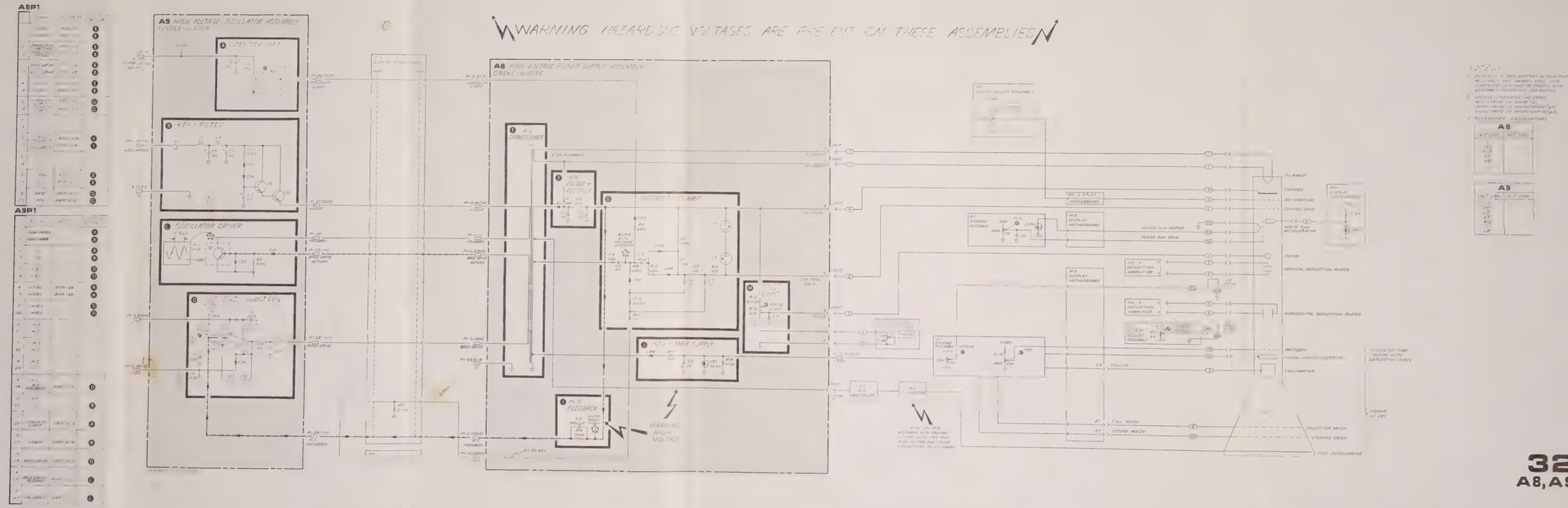


Figure 8-93. A8 High Voltage Power Supply Assembly and A9 High Voltage Oscillator Assembly, Schematic Diagram

A8 High Voltage Power Supply Assembly
A9 High Voltage Oscillator Assembly
SERVICE SHEET 32

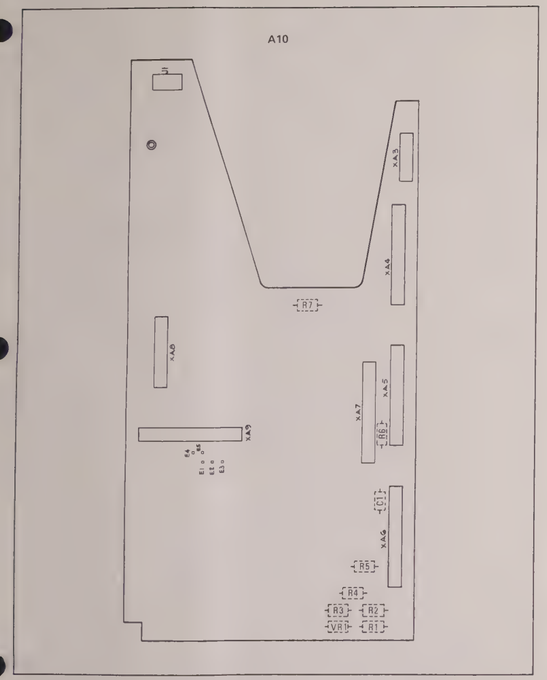
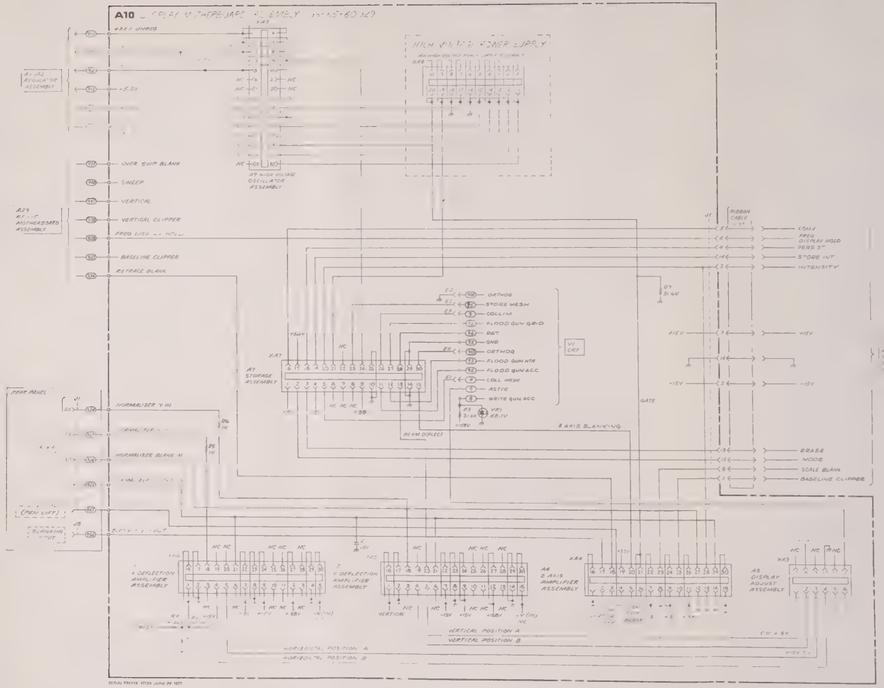


Figure 8-94. A10 Display Motherboard, Component Locations



A10

Figure 8-95. A10 Display Motherboard, Schematic Diagram

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A38 READOUT INPUT ASSEMBLY, CIRCUIT DESCRIPTION

The Readout Input Assembly accepts front-panel control position codes and time multiplexes them onto a bus. Some logical manipulation is performed to make the control code patterns more useful. As a result, seven groups of inputs derived from front-panel control codes are presented to the multiplex scanner. The seven groups are scanned in a sequence determined by the Readout Driver Assembly and are sent to that assembly via the six-line MX bus. The order in which the scan occurs (in terms of control positions) and the number of digits affected are as follows:

1. RESOLUTION BW: 3 digits
2. REF LEVEL dBm: sign, hundreds, tens; 3 digits
3. REFERENCE LEVEL FINE: units; 1 digit
4. INPUT ATTEN: 2 digits
5. LOG/DIV: 2 digits
6. SWEEP TIME/DIV: 2 digits
7. FREQUENCY SPAN/DIV: 3 digits

Function Scanner C

The Function Scanner multiplexes the seven groups of input lines. These input groups (each comprising six or fewer lines) are derived by processing the front panel control codes through various interface circuits. The time-multiplexed output from the Function Scanner occurs on the MX bus: lines MX1 through MX6. A low level on one of the Function Scanner Enable lines, FSE1 through FSE7, causes one input group to appear on the MX bus in inverted form. All logic levels connected with the scanner are 5-volt CMOS levels; i.e., a low must be between GND and +1.5V and a high must be between +3.5V and +5V.

BW Interface J

The six input lines to the BW Interface swing from approximately +15V to approximately −3.5V. These levels are shifted to 5-volt CMOS levels by resistor dividers with one end tied to another resistor divider, R20 and R21, and are sent to the Function Scanner. When FSE1 goes low, the input information appears on the MX bus in inverted form.

IF Gain Interface F

The IF Gain Interface has two types of input. IFG1, IFG2, and IFG3 swing between GND and a temperature-variable +10V level. These three lines go directly into CMOS inverters operating at the +10V level, the outputs of which are resistor-divided down to 5-volt CMOS levels. IFG4, IFG5, and IFG6 have three possible input levels. These are reduced to 5-volt CMOS levels by resistors R1 through R12 and EXCLUSIVE OR gates U11A, U11B, and U11C. When one of these inputs is approximately at GND potential, the output of the corresponding gate will be low. When the input assumes either a high level of approximately +15V or a low level of approximately −10V, the output of the gate will go high. These six lines go to the IF Gain Decoder.

IF Gain Decoder H

The IF Gain Decoder takes the six lines from the IF Gain Interface and reduces them to a four-bit binary number which reflects the IF attenuation in 10-dB increments. The four outputs go to an input port of the Reference Level Adder.

Reference Level Adder I , Fine Gain Interface G

The Reference Level Adder takes the binary number generated by the IF Gain Decoder and the binary number generated by the Input Attenuator Interface and adds them, using a four-bit full adder U16, and sends the resulting five-bit binary number to the Function Scanner. Also, pull-up resistors to +5V are provided for lines G0 through G3, which come in as either an open or a GND.

The Reference Level Adder has three additional functions. First, if the REFERENCE LEVEL FINE control is set to a number that exceeds nine, the output of U22B goes high and initiates a carry to the adder (increases the output result by one). Second, since the REFERENCE LEVEL has a range of +70 dBm to −102 dBm, the number displayed as the least significant digit of REF LEVEL must change depending on whether REF LEVEL is positive or negative. For example, if the REFERENCE LEVEL switch is set to 22 dBm and the REF LEVEL dBm is stepped down in 10 dB increments, the numbers on the Bezel Display must go 22, 12, 2, −8, −18, etc. To accomplish this, the sign of the reference level is detected by gates U22A and U14A and sent to the scanner in the same group as the REFERENCE LEVEL FINE code G0 through G3. Third, the place where the carry affects the tens digit depends on whether positive or negative numbers are being displayed. When counting down from 61, for example, the sequence is 61, 60, 59, etc., and the tens digit changes to 5 after crossing zero. On the other hand, when counting down from −29, for example, the sequence is −29, −30, −31, etc., and the tens digit changes before crossing zero. A zero occurring in the least significant digit and the polarity of the reference level are detected by gates U2A, U2B, U2C, U23B, and U14C. The output of U14C is high unless the REFERENCE LEVEL FINE control is at 0 or 10 and the polarity of the reference level is positive; then it goes low.

The reason for this apparent added complexity is that three-digit signed BCD arithmetic is being performed with only a four-bit binary adder and no memory.

The inputs described above appear as two groups of inputs to the Function Scanner. When LFSE2 goes low, the five bits from the adder and the line indicating a zero in the least significant digit are put on the MX bus in inverted form. When LFSE3 goes low, the information on lines G0 through G3, which carry the information for the least significant digit of the REF LEVEL, the line indicating whether dBm or dBμV selected, and the line indicating positive or negative numbers are placed on the MX bus in inverted form.

The jumpers for dBm/dBμV are normally connected for dBm. In the dBμV option the following changes occur:

1. A new set of binary numbers is generated by adding a binary 8 to the adder (the most significant bit of the adder Input Attenuator port is forced high; pin 15, U16).
2. Since dBμV will never involve negative numbers, the detection of a zero in the least significant digit is not necessary; it is avoided by removing pin 15, U15 from the output of U23B, and forcing it low.
3. Since dBμV is offset 5 dB from dBm in the least significant digit, the place where a carry occurs must be altered by changing the carry input to the adder from the output of U22B to line G3.
4. The fact that the REFERENCE LEVEL FINE code must be interpreted with a 5-dB offset is indicated by setting pin 15, U19 high.

These alterations are interpreted by the Readout Driver Assembly to yield a readout in dBμV. The front panel controls will still indicate dBm.

Input Attenuator Interface D

The inputs to the Input Attenuator Interface swing between GND and approximately +28V. These levels are reduced by resistor dividers to 5-volt CMOS levels, three of which are sent to U11D and U22C so that the final three lines will be a binary representation of the INPUT ATTEN setting. This information goes to one input of the Reference Level Adder and also to the Function Scanner. The three spare inputs to the Function Scanner are grounded. The six lines appear in inverted form on the MX bus when LFSE4 is low.

Log Scale Interface E

Three of the inputs to the Log Scale Interface switch between +15V and −3V and are resistor-divided down to yield 5-volt CMOS levels. The fourth input (LOG/LIN) swings between +15V and a temperature-variable −10V level. This is reduced by a resistor divider referenced to +3V to yield 5-volt CMOS levels. The two spare inputs to the Function Scanner are grounded. When LFSE5 goes low, the MX bus carries the inverted form of these six inputs.

Sweep Time Interface A

These are six main inputs to the Sweep Time interface that swing between GND and a +10V temperature-variable level. They require a high input impedance and thus go directly to CMOS inverters operating at the +10V level, the outputs of which are resistor-divided down to 5-volt CMOS levels. The Manual Sweep (MAN SWP) line swings from GND to approximatley +12V. It is reduced to a 5-volt CMOS level by a resistor divider and sent to U17C and U23A. Its function is to blank the sweep time readout when either manual or external sweep is used. Four input lines plus the two from the gates are sent to the scanner and appear on the MX Bus when LFSE6 goes low. The sense of the levels appearing on the MX bus is the same as that appearing at the input to the Sweep Time Interface, since two inversions occur.

Frequency Span Interface B

There are nine input lines to the Frequency Span Interface. All but two swing from approximately +15V to approximately −14V. this is reduced to 5-volt CMOS levels by resistor dividers referenced to +3V. The two exceptions are the FULL and MULTIBAND lines, which swing from +15V to −39V. These two lines are diode ORed and then reduced to 5-volt CMOS levels by a resistor divider referenced to GND. The resulting eight-line switch code is reduced to six line by gates U14B and U17B. The final six lines go to the Function Scanner and appear in inverted form on the MX bus when LFSE7 goes low.

A10 Display Motherboard
SERVICE SHEET 33

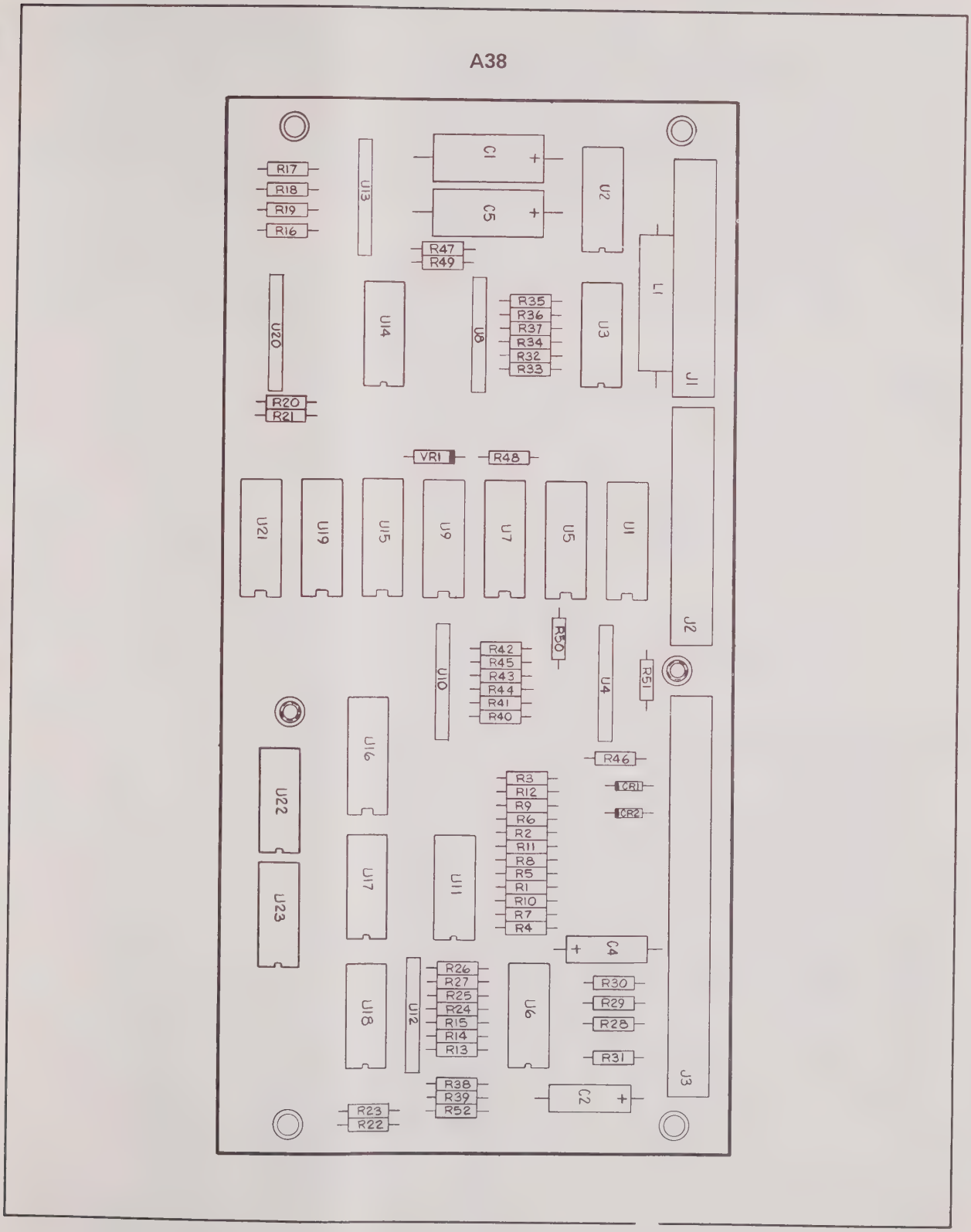

Figure 8-96. A38 Readout Input Assembly, Component Locations

FREQUENCY SPAN/DIV

	LINE –								
SETTING (Hz)	FS ÷ 100	FS ÷ 10	NAR-ROW	FS ÷ 2	FS ÷ 4	MULTI-BAND	FULL	FS X 2.5	ZERO
1K	H	H	H	H	L	LL	LL	L	L
2K	H	H	H	L	L	LL	LL	L	L
5K	H	L	H	L	H	LL	LL	L	L
10K	H	L	H	H	L	LL	LL	L	L
20K	H	L	H	L	L	LL	LL	L	L
50K	L	H	H	L	H	LL	LL	L	L
100K	L	H	H	H	L	LL	LL	L	L
200K	L	H	H	L	L	LL	LL	L	L
500K	L	L	H	L	H	LL	LL	L	L
1M	L	L	H	H	L	LL	LL	L	L
2M	L	L	H	L	L	LL	LL	L	L
5M	L	H	L	L	H	LL	LL	L	L
10M	L	H	L	H	L	LL	LL	L	L
20M	L	H	L	L	L	LL	LL	L	L
50M	L	L	L	L	H	LL	LL	L	LL
100M	L	L	L	H	L	LL	LL	L	L
200M	L	L	L	L	L	LL	LL	L	L
500M	L	L	L	L	L	LL	LL	H	L
F	L	L	L	L	L	LL	H	L	L
FULL	L	L	L	L	L	LL	H	L	L
1.7–22 GHz	L	L	L	L	L	H	LL	L	L
ZERO	H	X	H	X	X	X	X	X	H

H ≃ +15V L ≃ –14V
LL ≃ –39V X = EITHER STATE

SWEEP TIME/DIV

	LINE –						
SETTING (SEC)	ST CAL	ST FAST	ST X100	ST X10	ST X5	ST X2	MAN SWP
10	▽	H	H	H	H	H	▽
5	▽	H	H	H	H	▽	▽
2	▽	H	H	H	▽	H	▽
1	▽	H	H	▽	H	H	▽
.5		H	H	▽	H	▽	▽
.2	▽	H	H	▽	▽	H	▽
.1	▽	H	▽	H	H	H	▽
50m	▽	H	▽	H	H	▽	▽
20m	▽	H	▽	H	▽	H	▽
10m	▽	H	▽	▽	H	H	▽
5m	▽	H	▽	▽	H	▽	▽
2m	▽	H	▽	▽	▽	H	▽
1m	▽	▽	H	▽	H	H	▽
.5m	▽	▽	H	▽	H	▽	▽
.2m	▽	▽	H	▽	▽	H	▽
.1m	▽	▽	▽	H	H	H	▽
50μ	▽	▽	▽	H	H	▽	▽
20μ			▽	H	▽	H	▽
10μ	▽	▽	▽	▽	H	H	▽
5μ	▽	▽	▽	▽	H	▽	▽
2μ	▽	▽	▽	▽	▽	H	▽
AUTO	H	H	H	H	H	H	▽
EXT	X	X	X	X	X	X	HH

H ≃ +10V ▽ ≃ GND
HH ≃ +12V X = EITHER STATE

AMPLITUDE SCALE

	LINE			
SETTING	10 dB/ DIV	5 dB/ DIV	2 dB/ DIV	LOG/ LIN
10 dB/	H	L	L	H
5 dB/	L	H	L	H
2 dB/	L	L	H	H
1 dB/	L	L	L	H
LIN	L	L	L	LL

H ≃ +15V
L ≃ –3.5V
LL ≃ –10V

INPUT ATTEN

SETTING	LINE			
	1ØA1	2ØA2	2ØA3	2ØA4
0 dB	H	H	H	H
10 dB	▽	H	H	H
20 dB	H	▽	H	H
30 dB	▽	▽	H	H
40 dB	H	▽	▽	H
50 dB	▽	▽	▽	H
60 dB	H	▽	▽	▽
70 dB	▽	▽	▽	▽

H ≃ +28V ▽ ≃ GND

REF LEVEL

	LINE IFG –					
SETTING*	1	2	3	4	5	6
0 dB	H	H	H	▽	▽	▽
–10 dB	▽	H	H	▽	▽	▽
–20 dB	H	▽	H	▽	▽	▽
–30 dB	▽	▽	H	▽	▽	▽
–40 dB	H	▽	▽	▽	▽	▽
–50 dB	▽	▽	▽	▽	▽	▽
–60 dB	▽	▽	▽	H/L	▽	▽
–70 dB	▽	▽	▽	H/L	H/L	▽
–80 dB	▽	▽	▽	H/L		H/L
–90 dB	▽	▽	▽	H/L	H/L	H/L

H ≃ +10V ▽ ≃ GND
H/L ≃ EITHER +15V OR –10V
* WITH INPUT ATTEN AT 0 dB

RESOLUTION BANDWIDTH

	LINE BW –					
SETTING (Hz)	1	2	4	Ø	8	9
1K	H	L	L	L	H	L
1K	H	L	L	L	L	H
1K	H	L	L	L	L	L
3K	L	H	L	L	L	L
10K	L	L	L	L	L	L
30K	L	L	H	L	L	L
100K	H	L	L	H	L	L
300K	L	H	L	H	L	L
1M	L	L	L	H	L	L
3M	L	L	H	H	L	L

H ≃ +15V L ≃ –3.5V

REF LEVEL FINE

	LINE G –			
SETTING	3	2	1	Ø
0	▽		▽	▽
–1	▽	▽	▽	H
–2	▽	▽	H	H
–3	▽	▽	H	▽
–4	▽	H	H	▽
–5	▽	H	H	H
–6	▽	H	▽	H
–7	▽	H	▽	▽
–8	H	H	▽	▽
–9	H	H	▽	H
–10	H	H	H	H
–11	H	H	H	▽
–12	H	▽	H	▽

H ≃ +5V
▽ ≃ GND

Figure 8-97. A38 Readout Input Assembly, Schematic Diagram (1 of 2)

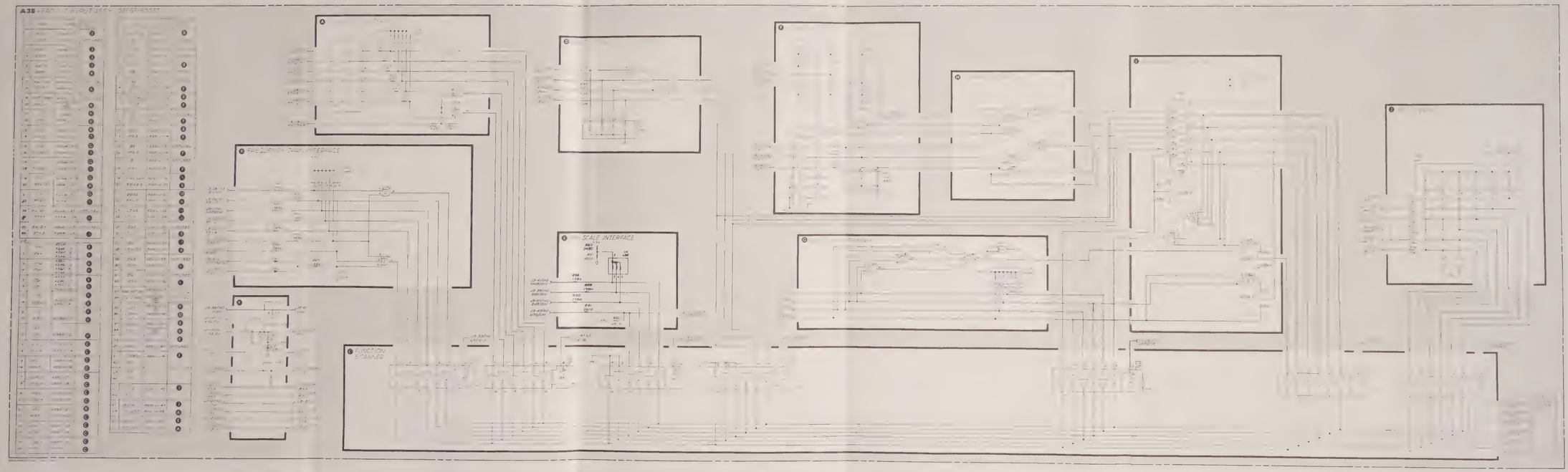

Figure 8-97. A38 Readout Input Assembly, Schematic Diagram (2 of 2)

A39 READOUT DRIVER ASSEMBLY, CIRCUIT DESCRIPTION

The function of the Readout Driver Assembly is to provide drive for the Bezel Display Assembly. There are three distinct groups of drivers on the board. The first accepts information about front-panel control settings and drives the corresponding 16 digits (see Readout Input Assembly). The second accepts information about the center frequency and drives the six center frequency digits. The third provides dc for annunciators. Annunciators that are switched get their information directly from the relevant controls and require only voltage level shifting. All levels in the assembly are assumed to be TTL levels unless otherwise specified; i.e., a low is between GND and +0.8V, and a high is between +2.0V and +5V.

Four-Bit Digit Counter (F)

U2 is a four-bit ripple counter that continually counts from 0 to 15 in binary form. The clock is derived from the Display Scanner Oscillator in the DVM Digital Assembly, so that the DVM display and the 16-digit bezel display will be synchronous. The counter advances on every negative-going clock transition. The four-bit output from the counter is sent directly to the Switch Code to Seven Segment Display Decoder and to the Sixteen Digit Decoder.

Sixteen Digit Decoder (G)

The Sixteen Digit Decoder takes the four-bit binary code from the Four-Bit Digit Counter and converts it to a 1-of-16 output. All outputs are high except the one corresponding to the binary count, which is low. Each output is numbered according to the binary number it represents.

Seven Function Decoder (H)

The Seven Function Decoder takes the 16 lines from the Sixteen Digit Decoder and generates a low on one of the seven output lines to indicate the function to which each group of digits is related. Thus, for the first three clock cycles, digits 0, 1, and 2 are enabled sequentially, while LFSE1 remains low. For the next three cycles digits 3, 4, and 5 are enabled and LFSE2 is low, and so on.

Switch Code to Seven Segment Display Decoder (J)

U6 is simply a 1024 x 8 ROM (Read Only Memory). For every combination of the 10 address inputs, a unique 8-bit data output code is generated.

Four of the address inputs come from the Four-Bit Digit Counter and carry the information as to which digit is enabled. The remaining six inputs come from the MX bus, which carries a modified switch code pertaining to the enabled digit. The switch code that is present on the MX bus has been dictated by the Seven Function Decoder.

These 10 unique inputs cause the ROM to generate the 8-bit data output to light the segments depicting the numbers corresponding to the front-panel switch settings. A low output will cause a segment to be lit. Unused input combinations generate all highs to blank the display.

Seven-Segment Driver (K)

The seven-segment displays in the Bezel Display Assembly are of the common-cathode type. This means that a current must be sourced to each of the segment LEDs to have them lit. This current is provided by the seven transistors of U22 and by Q7, which are all connected in an emitter-follower configution. Resistors R49 through R56 determine the magnitude of the current. For any given transistor, if the Driver Current Ramp (DCR) line is high (approximately +14V) and the open-collector inverter tied to its base is not conducting (the input from the ROM is low), then base current will flow through its associated base resistor and the transistor will turn on, causing the segment to be lit. The output levels on lines BDa through BDg and BDdp will then be slightly less than +5V. When the ROM changes state on the negative-going clock transition, DCR will be low (approximately GND), and all segment drivers will be off. Just before a change of state, DCR will ramp down from high to low, gradually turning the segment drivers off. Just after a change of state, DCR will ramp up from a low to high and gradually turn the segment drivers on. In this way the relatively large currents involved in the display will have controlled rise and fall times and will not generate the electrical interference usually associated with strobed digital displays.

Drive Current Ramp Generator (E)

The Drive Current Ramp Generator generates the drive current ramp signal DCR which controls the rise and fall times of the Seven Segment Driver and the Center Frequency Driver. The TTL input goes through resistors R42, R43, and R44 to generate roughly a ±1 mA current at the base of Q5. Since Q5 is connected as an integrator, this current will approximately equal the charging current for C2, generating nominal rise and fall times of about 50μsec at the collector of Q5. The output drive capability is increasd by Q6, which acts as an emitter follower and has an output swing from GND to approximately +14V. C3 and R47 at the collector of Q6 prevent the ramp current from getting on the +15V power supply line. The output is of opposite polarity from the input and is delayed by the ramp rise and fall times.

Duty Cycle Brightness Control (D)

The Duty Cycle Brightness Control is a TTL "one-shot" that controls the percentage of time that the seven-segment drivers are on during the allotted digit time slot. The CK input to pin 9, U10C prevents the "on" time from exceeding 75 percent, while the one-shot output appearing on pin 8, U10C allows the "on" time to be decreased to approximately 5 percent. This time is controlled by C4, R40, and R41. The output of U10C goes to the Drive Current Ramp Generator.

Sixteen-Digit Driver (L)

The Sixteen-Digit Driver boosts the current from the Sixteen-Digit Decoder to a level sufficient for the LED displays. Since the seven-segment displays in the Bezel Display Assembly are of the common-cathode type, this driver must sink the current from the lit segments of the driven digit. One of the 16 integrated Darlington drivers in U24 and U25 is enabled when the base is supplied current through it associated base resistor. This, in turn, requires that the open-collector inverter associated with the driver have a low input from the Sixteen Digit Decoder.

The output voltage level of the Darlingtons is not well defined. When a Darlington is off and no segments anywhere are lit by any other driver, the output will be pulled to a level near GND by the output pulldown resistor. If, however, another driver is lighting segments, the level will be between +1.5V and +2.0V on the outputs of the Darlingtons that are off. When a Darlington is on, the output level will be about +0.6V if no segment is lit, and between +1.0V and +1.5V if segments are lit, depending on the number of segments lit and individual device parameters.

Center Frequency Segment Driver (A)

The operation of the Center Frequency Segment Driver is identical to the Seven-Segment Driver except that the segment information is obtained from the DVM Digital Assembly instead of from the ROM. The same Drive Current Ramp (DCR) signal is used to control rise and fall times and "percentage on" time for both sets of drivers.

Center Frequency Digit Driver (B)

The DVM Digital Assembly generates six-digit scan lines HCF0 through HCF5, which are normally low and go high one at a time in sequence. Lines HCF1, HCF2, HCF4, and HCF5 are used directly by the Center Frequency Digit Driver as inputs to the four associated Darlingtons, which drive the two leftmost and two rightmost digits, much as in the Sixteen-Digit Driver.

Since the bezel display uses an entire digit for the decimal point (as opposed to the FREQUENCY GHz readout, which uses numeric displays with right-hand decimal points), the Center Frequency Digit Driver must blank one of the two center digits and supply it with decimal point information only. The time slot allotted for the center digit occurs when LCF3 is low, the time slot allotted for the decimal point occurs when LCFO is low, and the dpC line is low if the decimal point is to occur in the leftmost of the two center digits. U10B, U21A, U21B, U21C, and U21D decode this information from the DVM Digital Assembly and steer the middle digit and decimal point to the proper Darlington. The rules governing the levels of the Darlington for the Center Frequency Driver are identical to those for the Sixteen-Digit Driver.

Annunciator Drivers (C)

The Annunciator Drivers provide the dc for the annunciators that display the units of measure for the 16 bezel digits.

There are five annunciators, comprising a total of 12 subminiature LED lamps, which remain on constantly. These are broken into three groups of four LEDs each, the four being arranged in a series string. The current for the three strings is provided by three current sources, Q1, Q2, and Q3. R5, CR1, and R1 provide a fixed, temperature-compensated voltage for the bases of Q1, Q2, and Q3, while R2, R3, and R4 determine the magnitude of the current. Q1 supplies the current to light GHz and Hz/, Q2 supplies current to light dB ATTN, and Q3 supplies current to light Hz and dB.

The two lamps in series for the SEC/annunciator are lit by Q8, which generates a fixed current when either STμ, STM, or STS is switched to GND. (These correspond to Sweep Time Microseconds, Sweep Time Milliseconds, and Sweep Time Seconds.) The magnitude of the current is determined by R6, R8, and R10. R11 insures that Q8 will be turned off when none of the inputs is low (AUTO). In addition, when STM is switched to GND, current flows through R7 and lights the "m" in front of SEC/, and when STμ is switched to GND, current flows through R9 and lights the "μ" in front of SEC/.

All other annunciators are driven by the transistor array U19. When FSM (Frequency Span Megahertz) is switched to +15V, R24 supplies base current to the associated transistor and turns it on. This causes a fixed current, determined by R16, to light the "M" in front of Hz/. Likewise, when FSK (Frequency Span Kilohertz) is switched to +15V, a current (determined by R15) flows and lights the "k" in front of Hz/. When BWK (Bandwidth Kilohertz) is switched to +15V, current flows through R17 to light the "k" in front of Hz. When BWK is left open, its associated transistor is turned off, allowing current to flow through R19, R17, and R26, turning on the transistor whose base is tied to R26, causing a fixed current to flow through R18, and lighting the "M" in front of Hz. Similarly, when the LOG/LIN line is high the transistor associated with it turns on, pulling a fixed current through R14 to light dB/. When the LOG/LIN line is low current flows through R12, R14, and R20 to turn on the transistor whose base is tied to R20, causing a fixed current to flow through R13, lighting LIN.

A38 Readout Input Assembly
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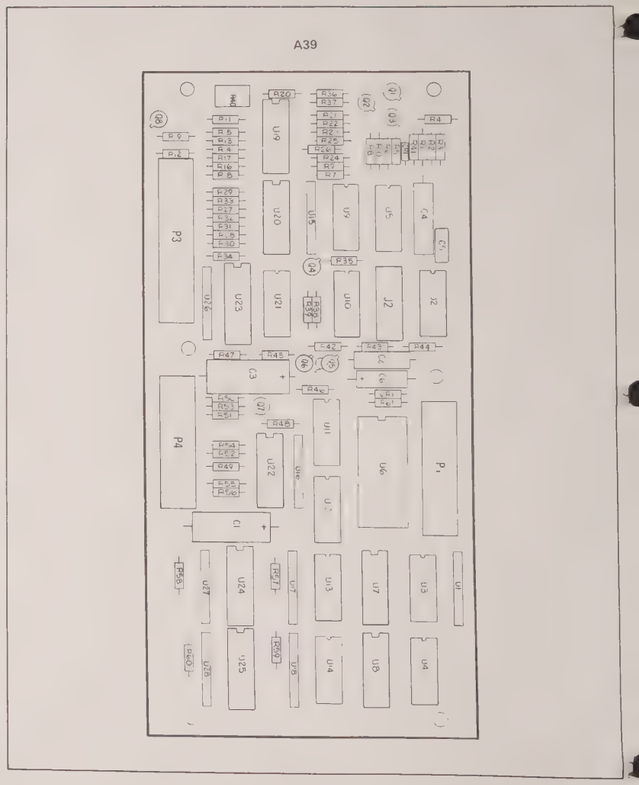
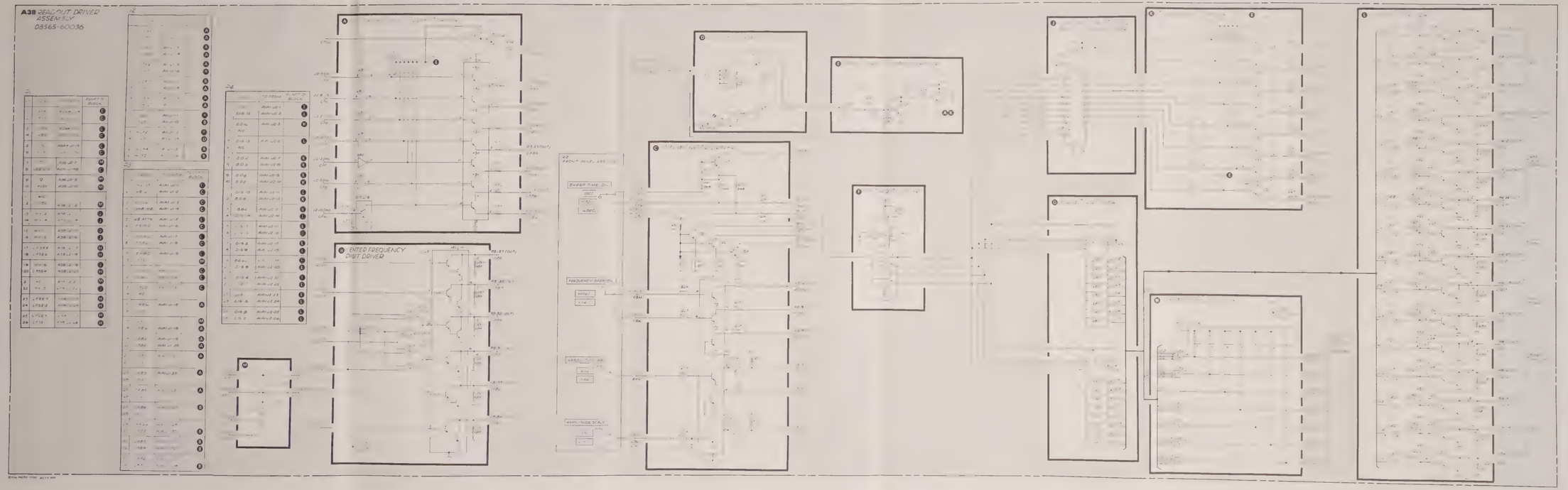


Figure 8-98. A39 Readout Driver Assembly, Component Locations



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A39

Figure 8-99. A39 Readout Driver Assembly, Schematic Diagram

SERVICE SHEET 36

The A40 Power Supply Assembly is made up of two subassemblies: A40A1 Rectifier Assembly and A40A2 Regulator Assembly. The Rectifier Assembly converts the voltages from the transformer secondary to unregulated dc voltages. These unregulated voltages are then regulated and distributed to the rest of the instrument by the Regulator Assembly.

There are nine regulated voltages (+5.2V, ±10V, ±15V, +20V, +30V, −40V, +158V) and one unregulated voltage (+26V UNREG). The regulated voltages are referenced to a +15V reference supply. The Rectifier Assembly contains the rectifiers for the +5.2V, ±15V, +20V, and −40V supplies. The +30V and +158V rectifiers are located in the Regulator Assembly. The ±10V supplies are derived from the regulated ±15V supplies.

A40A1 Rectifier Assembly

The Rectifier Assembly receives its line voltage from the Line Module Assembly FL1 through the Line Voltage Selector Card TB1 and Transformer T1. (See Figure 8-103.) C1, C2, and C3 reduce conducted RFI.

+5.2V Rectifier (A). The +5.2V Rectifier is a center-tapped, full-wave rectifier consisting of CR1 and CR2. Filtering is by C7. R1 acts as a bleeder resistor for C7 when the supply is shut off. C6 filters the diode switching transients, and C1 and C17 reduce the conducted RFI.

+15V Rectifier (B). The +15V rectifier is a full-wave bridge rectifier made up of CR3, CR4, CR5, and CR6. The ac ripple is filtered by C9, and the switching transients, by C8. R2 is the bleeder resistor for C9, and C2 is used to reduce the conducted RFI.

−15V, +20V, and −40V Rectifiers (C) (D) (E). The −15V, +20V, and −40V rectifiers are similar to the +15V rectifiers. In addition, the −40V rectifier has overvoltage protection which will short the transformer and blow the line fuse whenever the line voltage is above the line module setting. For example, if the line module is set for +120V and the instrument is plugged into a 240V outlet, VR1 will begin to conduct and turn on Q1. This will short the transformer secondary and blow the line fuse.

A40A2 Regulator Assembly

+15V Reference Supply (B). The +15V reference voltage is derived from the +6.2V reference zener diode VR3. This voltage is filtered by R15 and C18 and then amplified by U4 to +15V. The +15V output is fed back and applied to the inverting input of U4 through the voltage divider R16, R17, and R18. R17 adjusts the gain for +15V ± 0.005V out. C2 decreases the gain to unity at line frequencies for less ripple.

When first turned on, the output voltage of some op amps will rise with their positive supply voltages before beginning to regulate. This can cause the reference voltage to rise above +15V, which would trigger the overvoltage protection of the supplies, causing them to crowbar their outputs. To prevent this, VR2 is used to supply positive feedback, which prevents the output from going above about 13V before U4 goes into regulation. R14 supplies bias current to VR3, and R85 increases the available output current.

+5.2V Supply (H). There are four main elements to the supply: The error amplifier U1, R54, and R55; the series regulator Q1; the current limit R56, R57, R58, and Q11; and the overvoltage protection VR11, R60, and Q10. U1 compares the output (regulated) voltage +5.2V with the reference voltage +5.2V (derived from the +15V REF through the resistor divider R54 and R55) and applies base drive to the series pass transistor Q1 to regulate the output voltage.

The current limit is set by the voltage developed across R56 by the output current. As the output current increases, the voltage drop across R56 increases, which raises the voltage at the base of Q1. This also raises the voltage at the base of Q11 through the resistor divider R57 and R58. As the output current increases, Q11 begins to turn on and shunt the base drive of Q1 to the output. This starves the series regulator Q1, which lowers the output voltage and foldback limits the output current. This circuit is a foldback current limiter which has less current at short circuit than at its maximum current capability.

Overvoltage protection is enabled whenever the output voltage is high enough to forward bias VR11. This turns on the SCR Q10, which shunts the output and causes the supply to current limit. C11 and R56 roll off the gain to prevent oscillation, and CR27 protects the Q1 base-to-emitter junction from reverse breakdown. The LED DS6 is biased by R59 and turns on when the power supply is on. CR30 provides reverse voltage protection.

+10V, −10V, +15V, −15V, +20V, +30V, and −40V Supplies (I) (J) (D) (E) (A) (G) (F). The other supplies, except for the +158V Supply, operate similarly to the +5.2V Supply. The −40V and +30V Supplies have additional circuitry limiting the voltage supplied to the error amplifiers U2 and U9 to keep from exceeding the maximum supply ratings.

The −40V unregulated voltage is too high to supply U2 directly without damaging it. Q12 is used to limit the supply current, and VR6, VR7, and VR17 limit the voltage across U2 during high-power line operation and whenever the output of the supply is shorted. R34 supplies Q2 with the base drive during startup.

In the +30V Supply, VR14 keeps the output of U9 pin 6 from going below the negative terminal (pin 4) when the output of the supply is shorted. Q27 limits the output current of U9, and VR15 limits the voltage across its supply terminals. CR44, C17, R80, C16, and C15 form the rectifier for the +30V unregulated voltage. The resistor divider, R83 and R84, samples the line voltage from the transformer secondary. This voltage is sent to the Sweep Generator Assembly when the LINE mode of the SWEEP TRIGGER is selected.

The +26V UNREG voltage is tapped off from the input to the +20V Supply.

+158V Supply (C). The +158V supply is similar to the others except for the manner in which the error amplifier controls the series regulator.

Q31 acts as a constant current source (~5 mA) set by CR21, CR22, and R41 (see Figure 8-100). This current is either fed as base drive to the series regulator Q9 or shunted to ground by U10 through Q29. The base voltage of Q29 is fixed by the voltage divider R42 and R44. This enables U10 to control the base current to Q9 by regulating the current through Q29. CR23 helps to quickly bring U10 into regulation and to prevent the output voltage from overshooting on startup. C6, R43, C7, and C10 prevent the output voltage from overshooting and triggering the overvoltage protection circuit after the removal of a short at the output.

Q28, R47, R48, and R50 form the current limiting circuit. VR9, VR10, R52, and Q30 form the overvoltage protection. C9 and R47 roll off the gain to prevent oscillation. DS5 is biased on by R51 to indicate when the supply is on.

CR26, C8, R40, C21, and C22 make up the rectifier, which is similar to the other full-wave bridge rectifiers except that the four-diode bridge is one package, CR26.

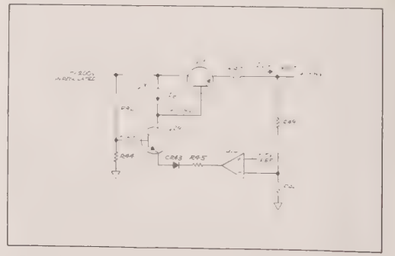

Figure 8-100. +158V Regulator Circuitry, Simplified Schematic

A39 Readout Driver Assembly
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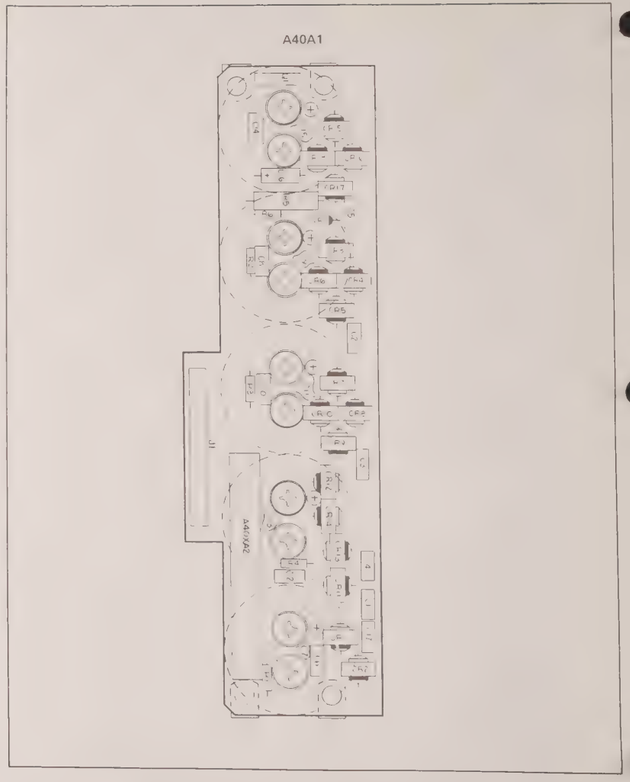


Figure 8-101. A40A1 Rectifier Assembly, Component Locations

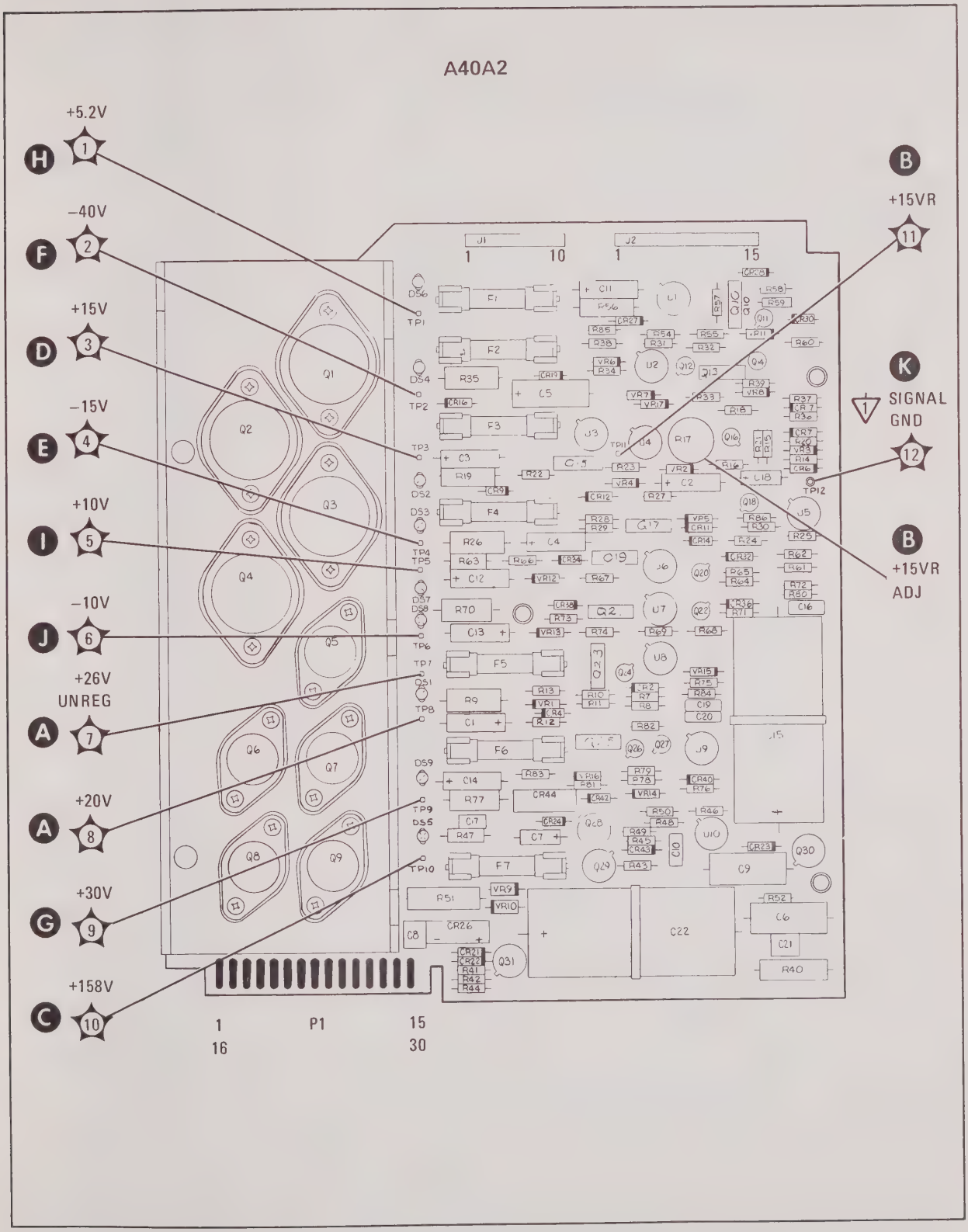


Figure 8-102. A40A2 Regulator Assembly, Component Locations

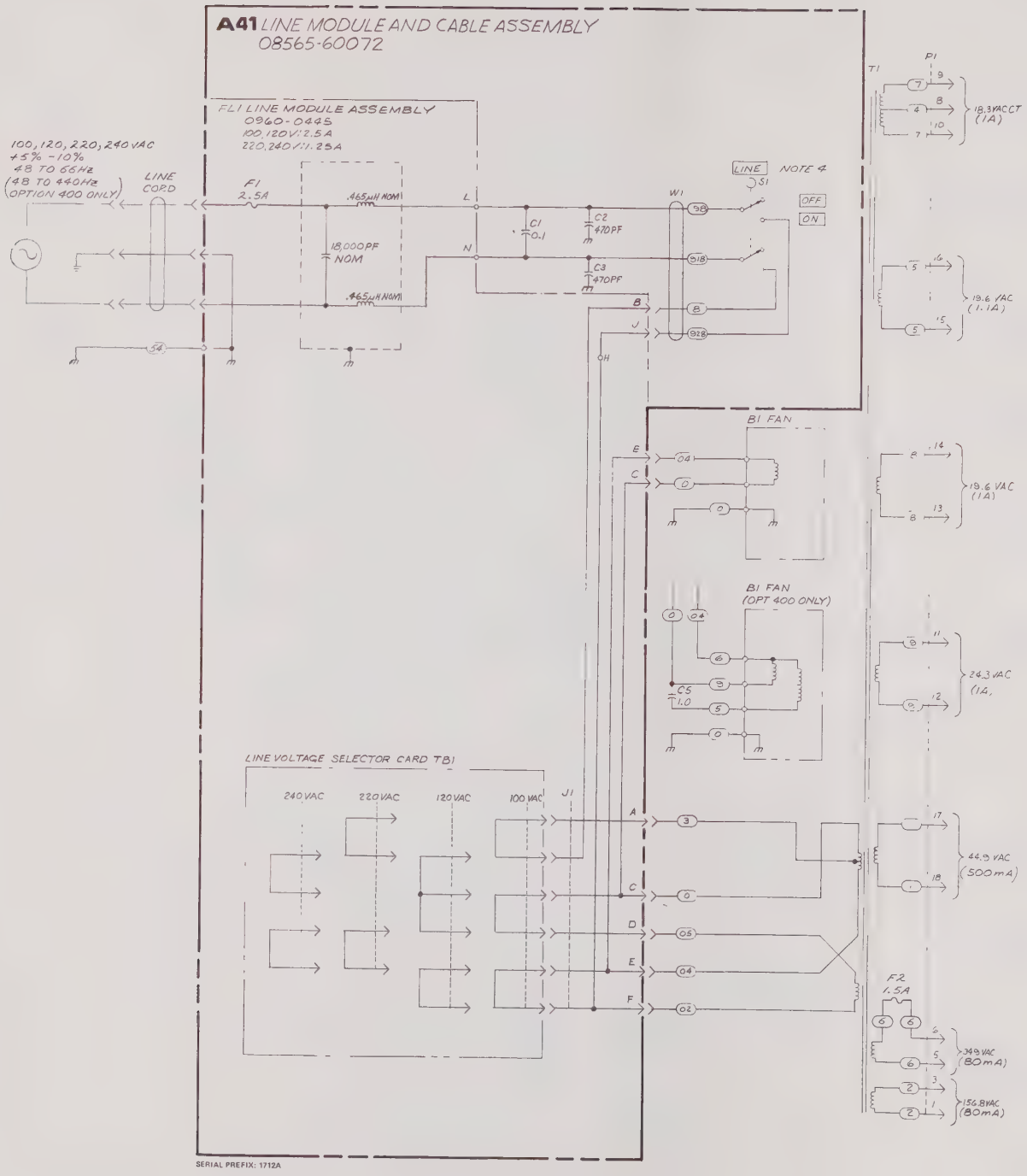
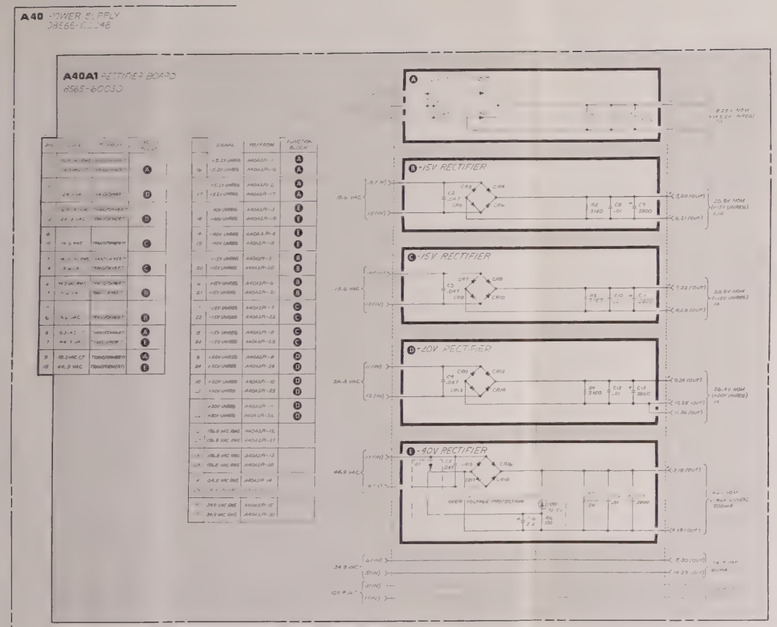


Figure 8-103. A40A1 Rectifier Assembly, A50A2 Regulator Assembly, and A41 Line Module and Cable Assembly, Schematic Diagram (1 of 2)



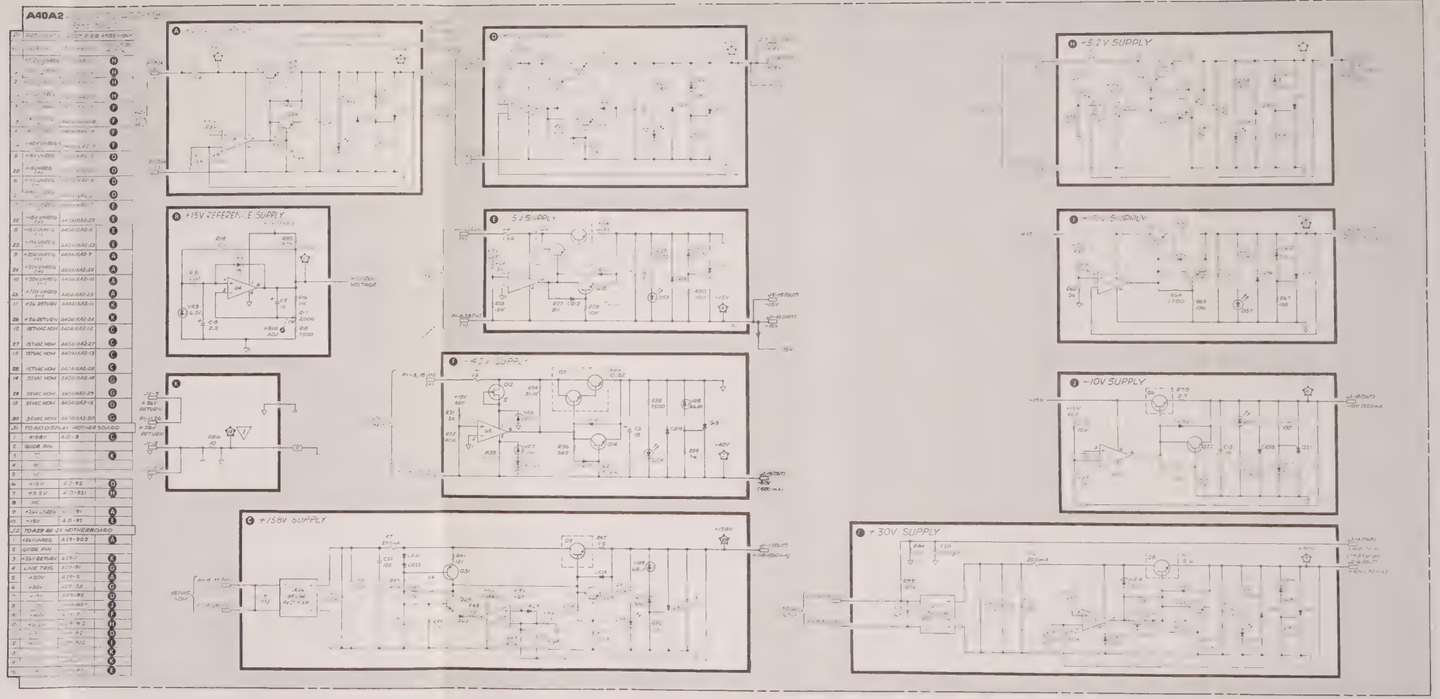


Figure 8-103. A40A1 Rectifier Assembly, A40A2 Regulator Assembly, and A41 Line Module and Cable Assembly, Schematic Diagram (2 of 2)

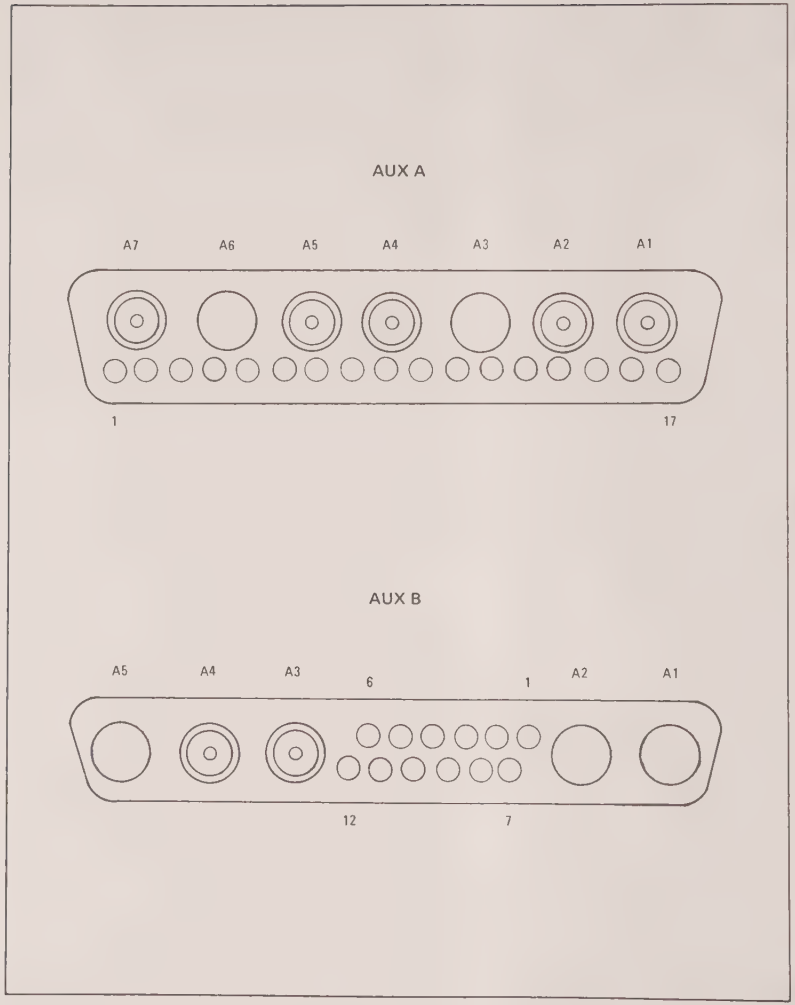


Figure 8-104. Rear Panel AUX A and AUX B Signal Identification (1 of 2)

A40A1 Rectifier Assembly
A40A2 Regulator Assembly
A41 Line Module and Cable Assembly
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Pin Number	Wire Color Code	Signal
AUX A (J1)		
1		NC
2		NC
3		NC
4		NC
5		NC
6		NC
7	925	NORMALIZER CONTROL IN
8		NC
9		NC
10		NC
11	968	HORIZONTAL SWEEP OUTPUT
12		NC
13		NC
14		NC
15		NC
16		NC
17		NC
A1	978	VERTICAL OUTPUT
A2	957	PEN LIFT
A3		NC
A4	923	NORMALIZER X IN
A5	924	NORMALIZER Y IN
A6		NC
A7	926	NORMALIZER BLANK IN
AUX B (J2)		
1	913	B1
2	914	B2
3	915	B3
4	916	B4
5	917	B5
6	918	B6
7	95	STOP SWP
8	904	YTF MOD
9	94	MARKER
10		NC
11		NC
12		NC
A1		NC
A2		NC
A3	2 (COAX)	YTO FREQ ANALOG
A4	3 (COAX)	YTF FREQ ANALOG
A5		NC

Figure 8-104. Rear Panel AUX A and AUX B Signal Identification (2 of 2)

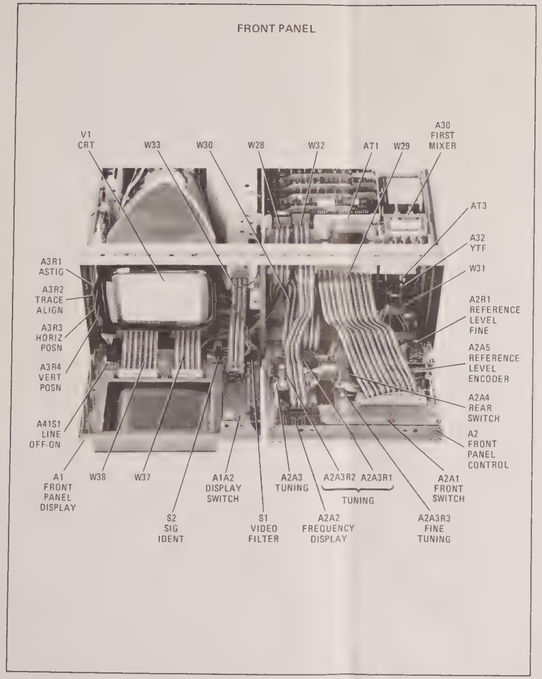


Figure 8-105. Model 8565A Major Assembly and Component Locations, Front Panel

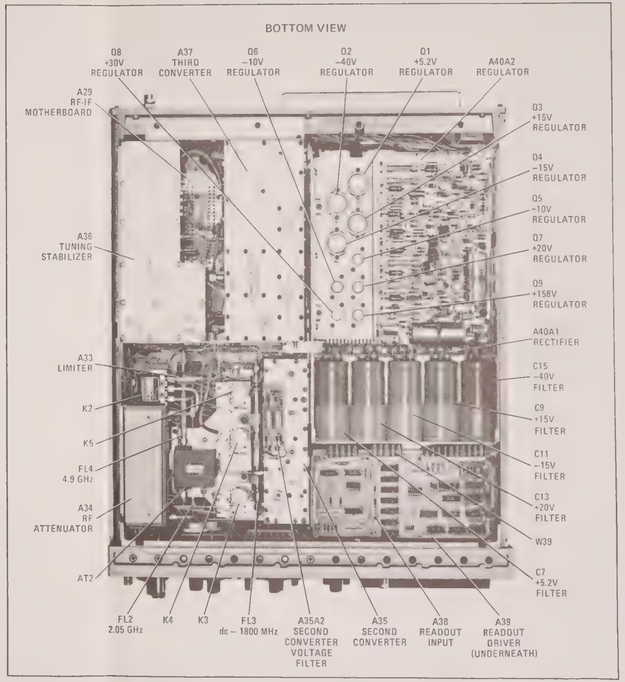
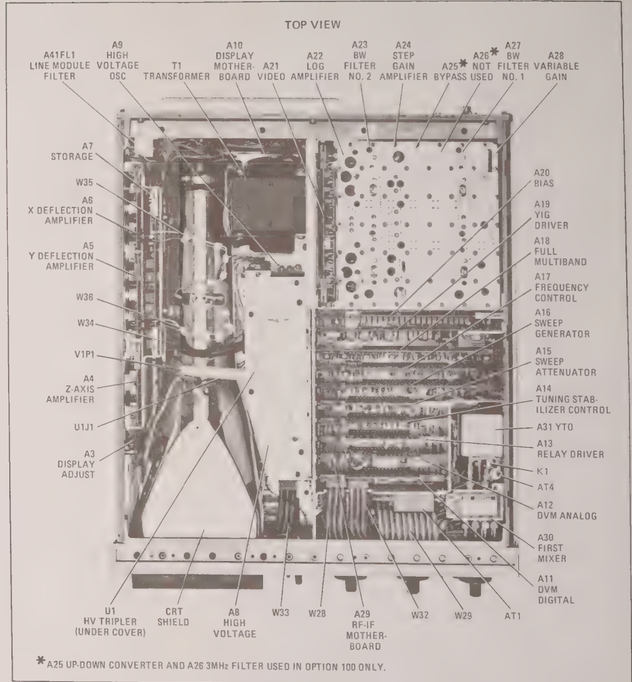


Figure 8-106. Model 8565A Major Assembly and Component Locations, Bottom View



*A25 UP-DOWN CONVERTER AND A26 3MHz FILTER USED IN OPTION 100 ONLY.

Figure 8-107. Model 8565A Major Assembly and Component Locations, Top View

MAJOR ASSEMBLY AND
COMPONENT LOCATIONS

SERVICE SHEET 37

A25 UP-DOWN CONVERTER ASSEMBLY (OPTION 100), CIRCUIT DESCRIPTION

The Up-Down Converter Assembly converts the 21.4 MHz IF (from the Bandwidth Filter No. 1 Assembly) down to a 3 MHz IF so that it can be filtered by the 3 MHz Filter Assembly. It then converts the filtered 3 MHz IF back up to 21.4 MHz. Since Q is equal to center frequency divided by bandwidth, the use of 3 MHz to shape the most narrow bandwidths (100 Hz, 300 Hz, and 1 kHz) allows a design with crystals of more feasible Q.

Switchable Gain Amplifier (A)

The Switchable Gain Amplifier is controlled by the same line (IFG2) that controls the 3dB Amplifier in the Step Gain Amplifier/Oscillator Assembly. With Option 100 installed, the 3 dB Amplifier yields only about 3 dB gain. The other 17 dB is provided by the Switchable Gain Amplifier. When IFG2 is high, the gain is unity. When IFG2 is low, CR11 is on, and the gain is:

$$G = 1 + \frac{R44}{R46} \triangleq 17 \text{ dB}$$

Switch and Bypass (B)

The Switch and Bypass circuit routes the 21.4 MHz IF straight through to the Step Gain Amplifier/Oscillator Assembly for bandwidths ≥ 3 kHz (SWITCH line approximately -8V). For bandwidths ≤ 1 kHz (SWITCH line approximately $+14$V) the signal is routed through the Down Converter, then to the 3 MHz Filter Assembly, and back to the Up Converter. Diodes CR1, CR2, CR4, and CR5 act as switches controlled by the SWITCH line.

Down Converter (C)

The Down Converter first matches the 21.4 MHz to a low impedance through C6, C7, and L1 with a corresponding decrease in gain of about 15 dB. This signal is mixed with 18.4 MHz from the LO Driver, which is turned on by the SWITCH line through CR6. The difference frequency (3 MHz) is selected by the bandpass filter C12, L2, and R17 and amplified by the complementary-pair feedback amplifier Q10 and Q11. DC GAIN potentiometer R20 is adjusted so that the gain in the down-converted path is equal to the gain (unity) in the bypass path.

Up Converter (D)

The Up Converter mixes the 3 MHz from the 3 MHz Filter Assembly with the 18.4 MHz from the LO Driver. The sum frequency (21.4 MHz) is selected by matching filter L3 and C19 and is amplified by Q2. Q3, Y1, and C26 form a narrow bandwidth (~ 10 kHz) 21.4 MHz Bandpass Filter to elimiante 18.4 MHz and its harmonics from the signal path. LO NULL adjustment C24 maximizes the out-of-band rejection.

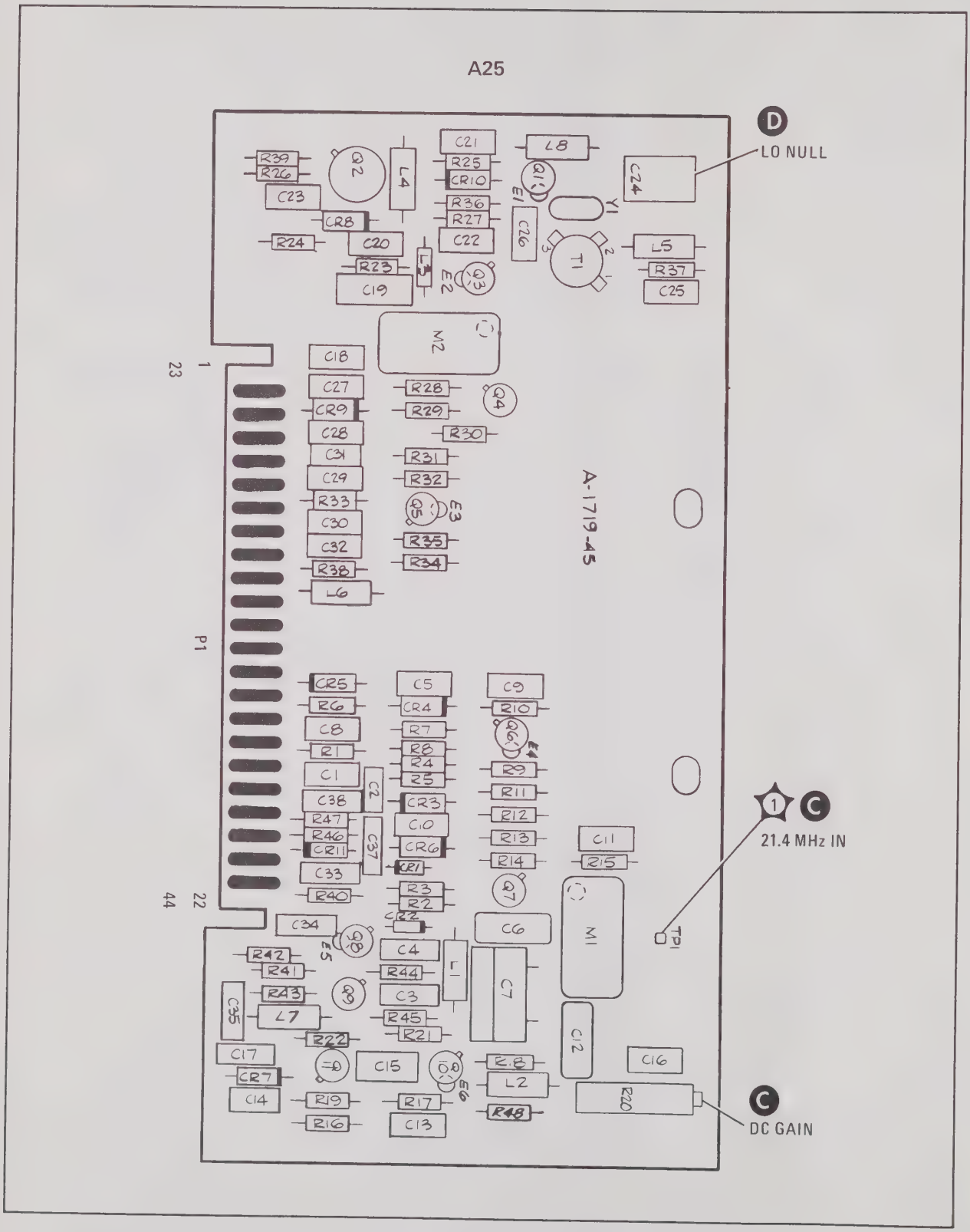
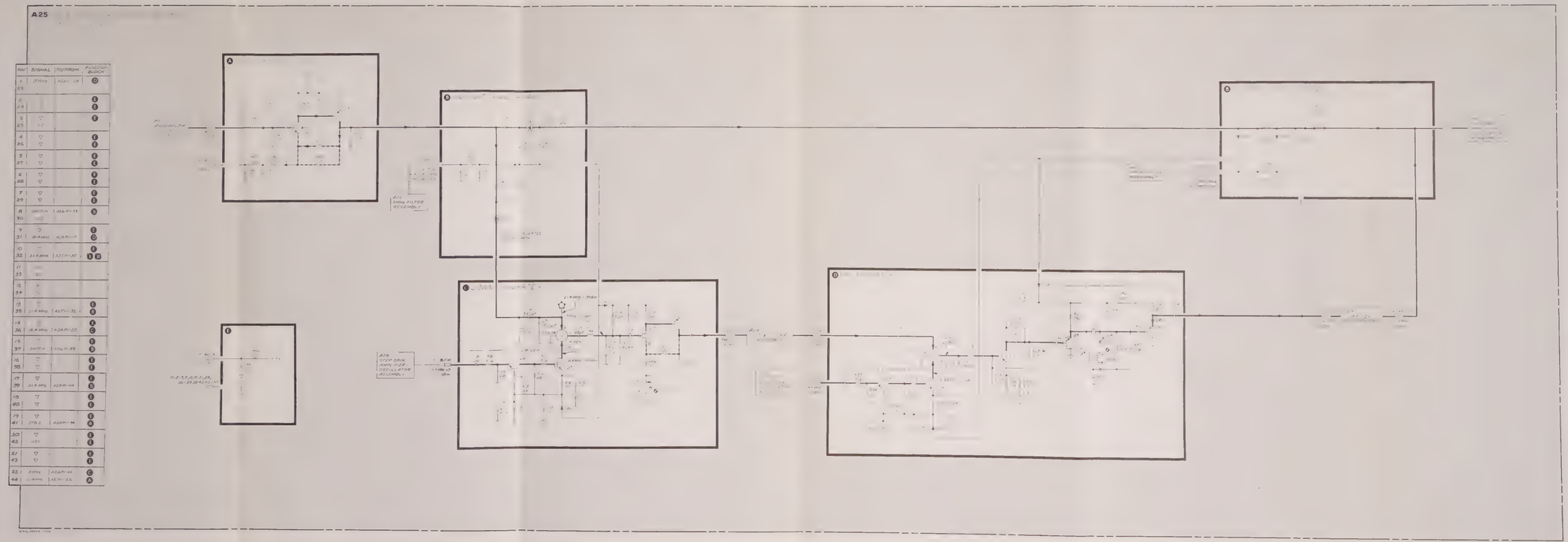


Figure 8-108. A25 Up-Down Converter Assembly (Option 100), Component Locations



A25

Figure 8-109. A25 Up-Down Converter Assembly (Option 100), Schematic Diagram

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A26 3 MHz FILTER ASSEMBLY (OPTION 100), CIRCUIT DESCRIPTION

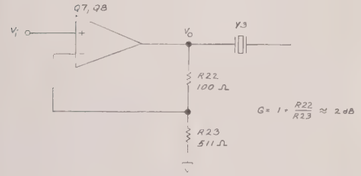
A26 3 MHz Filter Assembly provides filtering for the bandwidths 1 kHz, 300 Hz, and 100 Hz. The 21.4 MHz IF from A27 Bandwidth Filter No. 1 Assembly is down-converted to 3 MHz in A25 Up-Down Converter Assembly. After filtering, the 3 MHz IF is up-converted to 21.4 MHz in A25 and sent to A24 Step Gain Amplifier/Oscillator Assembly.

The 3 MHz Filter Assembly consists of five almost identical, synchronously tuned crystal filtering stages, an Output Buffer Amplifier, and a Bandwidth Control circuit. The bandwidths of all the stages are switched simultaneously to yield bandwidths of 1 kHz, 300 Hz, and 100 Hz. These bandwidths can be changed only by the selection of resistance values.

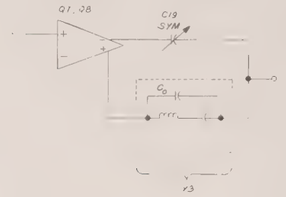
The Third Stage (typical of all five filtering stages), the Output Buffer Amplifier, and the Bandwidth Control are described below.

Third Stage (D)

Q7 and Q8 act as a complementary-pair buffer amplifier. R22 and R23 determine the gain:

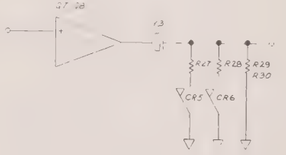


A portion of the signal is on the emitter of Q7; this signal is 180 degrees out of phase with the input signal, producing an inverted output that is used to cancel out the case capacitance of crystal Y3. SYM adjustment C19 varies the inverted current into the output of the stage so that it is equal in magnitude and opposite in phase to the current through the case capacitance (C_0) of the crystal:



CTR adjustment C20 and L6 are used to compensate for undesired capacitances (PC board, etc.)

The Q (and therefore the bandwidth) of the stage is determined by R27* and R28* in the Third Stage and the parallel combination of R29* and R30* in the Fourth Stage. CR5 and CR6 act as switches:



In the 1 kHz bandwidth, CR5 and CR6 are off, and BW8 and BW9 are low. Therefore, the Q is determined only by R29* and R30*. In the 300 Hz bandwidth, BW9 goes high (about ≤15V) and turns CR6 on. For this bandwidth, only R28* is used to determine the Q. In the 100 Hz bandwidth, BW8 goes high (about ≤15V) and turns CR5 on. For this bandwidth, only R27* is used to determine the Q.

Output Buffer Amplifier (G)

The Output Buffer Amplifier acts as an op amp connected for non-inverting operation. A simplified schematic is shown in Figure 8-110.

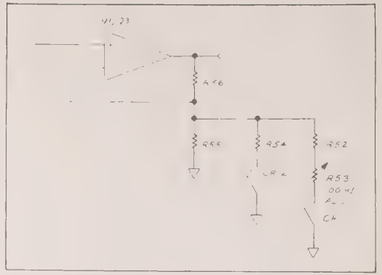


Figure 8-110. Output Buffer Amplifier Simplified Schematic

With CR11 and CR12 off (BW8 and BW9 low, the gain of the circuit is:

$$G = 1 + \frac{R56}{R55} \simeq 3\ dB$$

When BW8 or BW9 goes high, putting the filters in a more narrow bandwidth, the filters require more gain to compensate for the increased loss. BW8 and BW9 switch in CR11 and CR12 respectively to accomplish this. The gain correction is about 1 dB or less.

Bandwidth Control (B)

The Bandwidth Control circuit determines the voltage on the SWITCH line. Q13 sinks about 8 mA whether the SWITCH line is high or low. If neither BW8 nor BW9 is pulled high from the front panel, and if BW10 is not pulled high by the Video—100 Hz Assembly, then Q13 pulls the SWITCH line down to about −8V.

A25 Up-Down Converter Assembly (Option 100)
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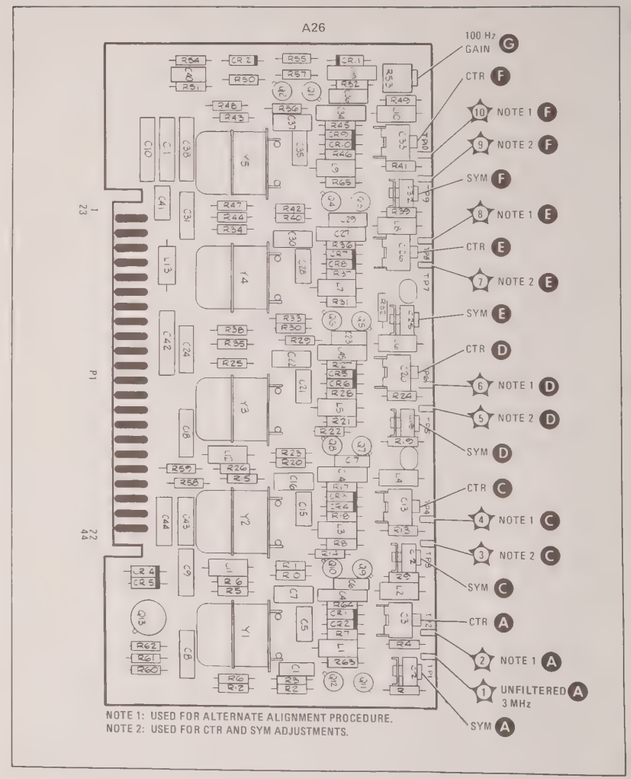
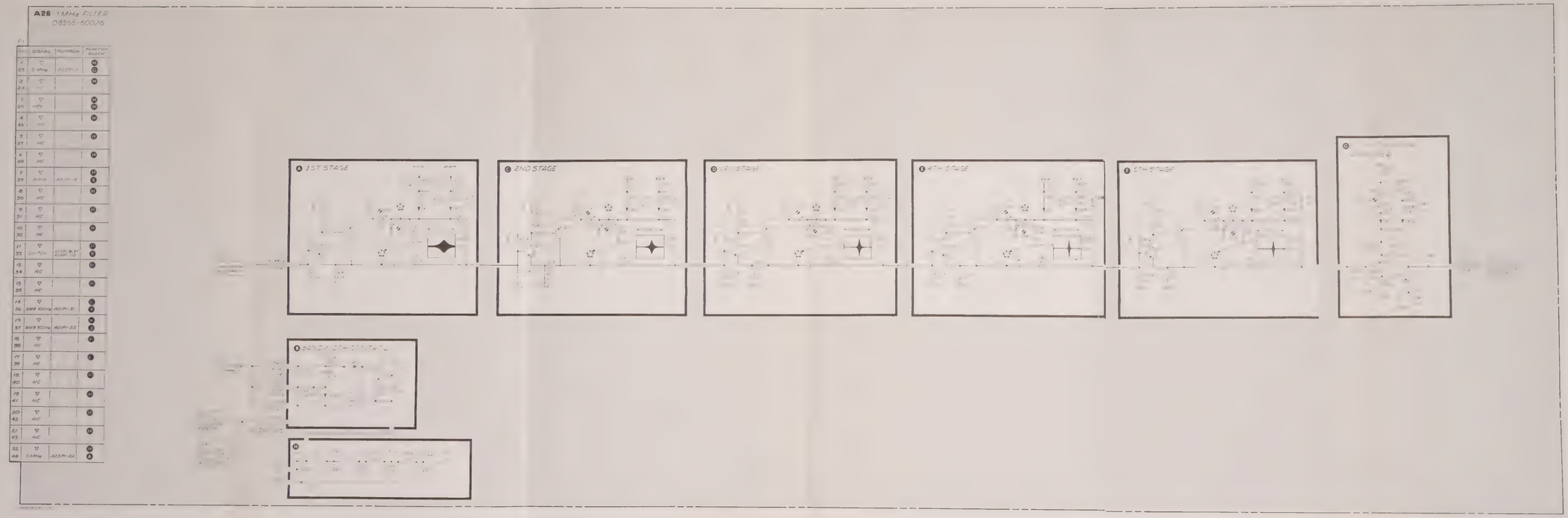


Figure 8-111. A26 3 MHz Filter Assembly (Option 100), Component Locations



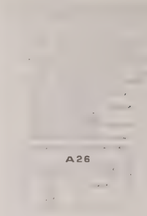


Figure 8-112. A26 3 MHz Filter Assembly (Option 100), Schematic Diagram

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A24 STEP GAIN AMPLIFIER/OSCILLATOR ASSEMBLY (OPTION 100), CIRCUIT DESCRIPTION

The Step Gain Amplifier/Oscillator Assembly contains three amplifier stages to provide a 0 to 50 dB amplification of the 21.4 MHz third IF signal. A simplified schematic of the amplifier stages is shown in Figure 8-113. The amplifier stages are selected by the front-panel REFERENCE LEVEL switch. At the output of the final amplifier is a two-section bandpass filter. In conjunction with the front panel REFERENCE LEVEL FINE control, the Step Gain Amplifier/Oscillator Assembly also contains the circuitry for the 0 to 12 dB fine control for the reference level. A TEST/NORM switch is available; in TEST position, tests are made at a low gain level.

An 18.4 MHz Oscillator is provided in this assembly for use only in the 1 kHz, 300 Hz, and 100 Hz bandwidths. This LO signal is used in the Up-Down Converter Assembly.

0 — 12 dB Control (A)

The front-panel REFERENCE LEVEL FINE control provides approximately 0.3 to 12.3 dB of attenuation at the base of Q7. By regulating the current flow through the PIN diode CR3, the amount of signal attenuation is controlled. For example: if diode currrent flow is increased, more RF signal is shunted or bypassed to ground. C12 provides the RF ground and also isolates from ground the variable dc from the REFERENCE LEVEL FINE adjustment.

A minimum current flow through the PIN diode (maximum diode resistance) is established by the −12 dB adjustment R6 so that the diode is never completely cut off. Adjustment of R6 sets the 0.3 dB point and is adjusted with the REFERENCE LEVEL FINE control fully clockwise (−12 position).

The maximum current flow through the PIN diode is set by the 0 dB adjustment R5. R5 is adjusted to the 12.3 dB attenuation point with the REFERENCE LEVEL FINE control fully counterclockwise (0 position).

Transistors Q8 and Q9 are identical current sources. The maximum current is set by R5 in the common base circuit. Diode CR1 provides temperature compensation for the transistors.

Q8 provides current for a bias voltage applied to the anode of the PIN diode CR3. The voltage source consists of R6, R17, and CR2. CR2 provides temperature compensation for the PIN diode. Inductor L5 isolates the current source from the RF signal.

Q9 provides current for a variable voltage source at the cathode of CR3. The REFERENCE LEVEL FINE control, in parallel with R9, is used to match the PIN diode resistance changes. The voltage at the PIN cathode is varied to control CR3 current flow. When the REFERENCE LEVEL FINE control is fully clockwise, the PIN diode is at minimum conduction and maximum signal is applied to the base of Q7. Conversely, when the control is fully counterclockwise, the PIN diode is forward biased at maximum conduction, and minimum signal is applied to Q7.

Buffer amplifier Q7 operates as an emitter-follower and provides isolation between the 0 — 12 dB Control circuit and the Up-Down Converter Assembly.

Step Gain Amplifiers (B) (C) (D)

The three step gain amplifiers (10 dB Amplifier, 3 dB Amplifier, and 20 dB Amplifier) can be considered as operational amplifiers. An equivalent circuit for the three stages is shown in Figure 8-114. The gain for each amplifier is $Av = 1 + R_f/R_i$. The feedback resistance R_f for the 10 dB Amplifier is R26, 562 ohms; for the 20 dB Amplifier is R38, 750 ohms; and for the 3 dB Amplifier is R32, 215 ohms. The input resistance R_i is a combination of a fixed series resistance (56.2 ohms) and the controlled resistance of the PIN diodes. The resistance of the PIN diodes is approximately 10 to 1000 ohms and increases as the forward bias current is decreased from 10 mA to 10 μA. R_i is approximately 260 ohms for the 10 dB Amplifier, 83 ohms for the 20 dB Amplifier, and 520 ohms for the 3 dB Amplifier. Selection of the correct combination of step gain amplifiers is effected by the front-panel REF LEVEL dBm control. Rotating the switch grounds the emitter circuit of the selected amplifier(s), allowing current to flow through the PIN diode(s). The possible switch combinations allow the gain to vary from unity (all switches open) to 33 dB maximum gain with all three emitter circuits grounded.

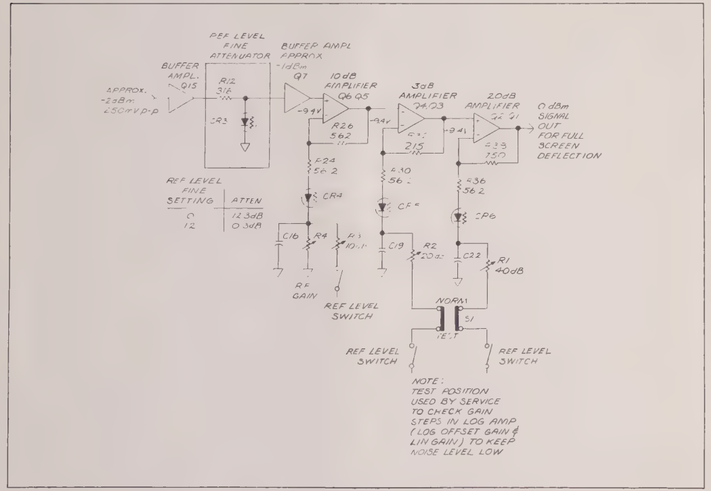

Figure 8-113. Amplifier Stages, Simplified Schematic

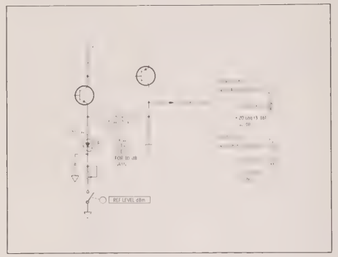

Figure 8-114. Step Gain Amplifiers, Equivalent Circuit

A TEST/NORM switch S1 is included in the emitter paths of the 3 dB and 20 dB step gain amplifiers. The switch disables 23 dB of gain for use when making LOG amplifier adjustments.

21.4 Bandpass Filter (E)

The output of the step gain amplifiers is coupled through a two-section bandpass filter. The filter consists of L9, L10, C24, and C25 and passes only the 21.4 MHz signal.

18.4 MHz Oscillator (F)

The 18.4 MHz Oscillator is basically a Colpitts oscillator with a crystal in the feedback path. A simplified schematic is shown in Figure 8-115. The oscillator is used only when the 1 kHz, 300 Hz, or 100 Hz resolution bandwidth is selected. For these three bandwidths, the SWITCH line goes to approximately +14V, turning the oscillator on. The output of the oscillator should be about −10 dBm.

If the crystal were replaced with a large capacitor, the circuit would oscillate at the resonant frequency of the parallel resonant circuit made up of L11, C32, and C33. The resonant frequency is in the range 17.8 MHz to 19.0 MHz. When the crystal is inserted, the feedback path is broken except at the series resonance of the crystal (18.4 MHz). A fixed capacitor and an air-variable capacitor are in series with the crystal and can pull it several kHz either side of 18.4 MHz.

The voltage output is determined by the current through R55* times the collector load. If the output is too low, the resistance of R55* can be decreased.

The collector voltage is divided by C32 and C33 and goes to the buffer amplifiers (Q14, Q15 and Q12, Q13). The division ratio is:

$$\frac{\frac{1}{200}}{\frac{1}{200}+\frac{1}{100}}=\frac{1}{3}$$

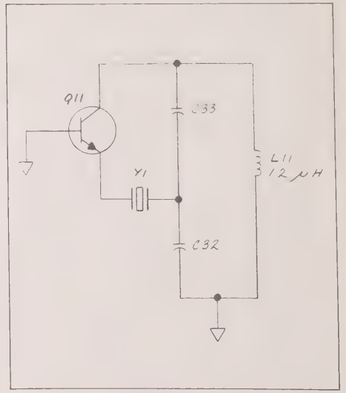

Figure 8-115. 18.4 MHz Oscillator, Simplified Schematic

A26 3 MHz Filter Assembly (Option 100)
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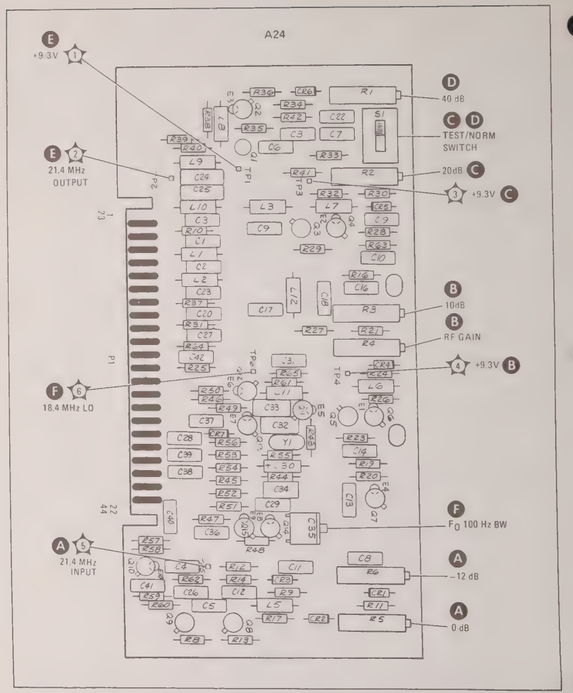
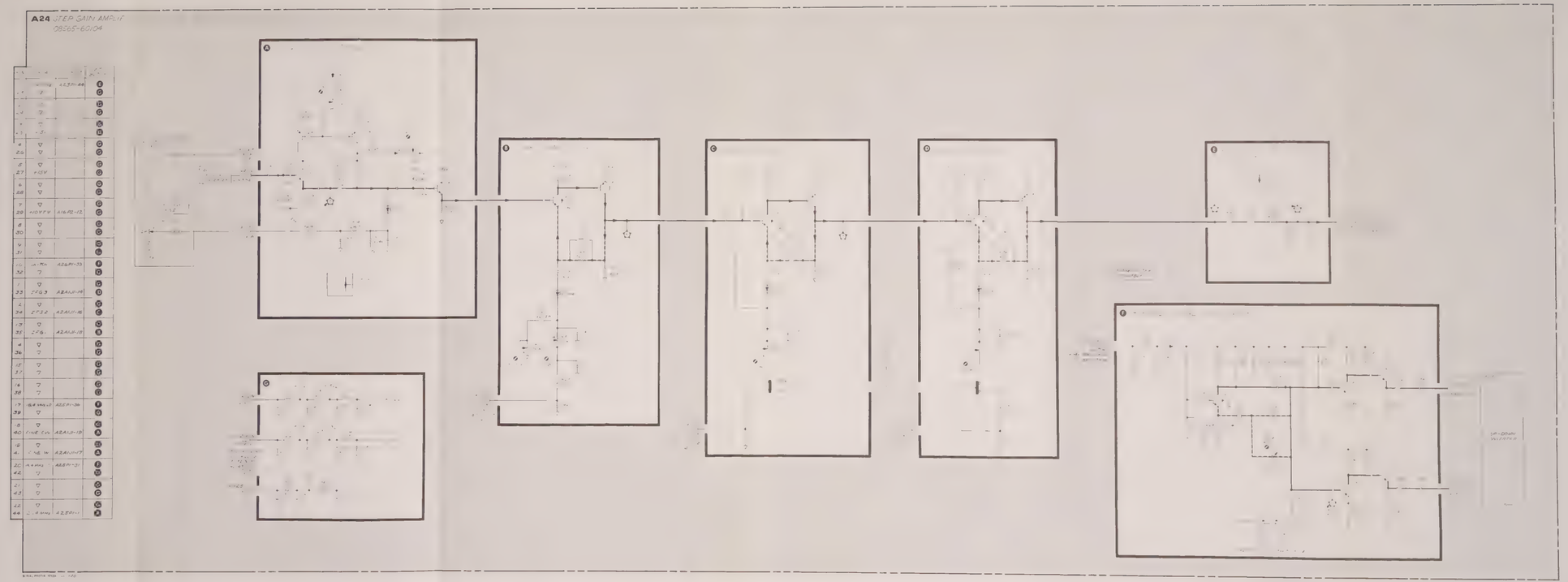


Figure 8-116. A24 Step Gain Amplifier Oscillator Assembly (Option 100), Schematic Diagram



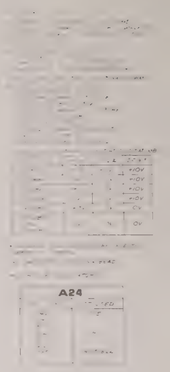


Figure 8-117. A24 Step Gain Amplifier Oscillator Assembly (Option 100), Schematic Diagram

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A21 VIDEO–100 Hz ASSEMBLY (OPTION 100), CIRCUIT DESCRIPTION

The Video-100 Hz Assembly filters the detected signal from the Log Amplifier Assembly as selected by the VIDEO FILTER and RESOLUTION BW switches. It scales the amplitude according to the AMPLITUDE SCALE selected at the front panel. It also controls the Bandwidth Filter No. 1 and No. 2 Assemblies to determine selection of RESOLUTION BW, and it varies the AUTO Sweep Time according to VIDEO FILTER and RESOLUTION BW settings.

The Video–100 Hz Assembly contains the Video Filter Resistor Select, the RESOLUTION BW control circuitry (consisting of the Crystal-LC BW Select, the Crystal Bandwidth and Video Filter Capacitor Select, and the LC Bandwidth and Video Filter Capacitor Select), and the Amplitude Scale circuitry (consisting of the First Video Amplifier, the Scale Attenuator, and the Second Video Amplifier).

Video filtering is accomplished by the use of an RC filter. The amount of filtering is proportional to the resolution bandwidth; therefore, whenever the VIDEO FILTER switch or the RESOLUTION BW switch position is changed, it is necessary to change the degree of filtering. The VIDEO FILTER switch varies the resistive portion of the RC filter by switching in different resistors in the Video Filter Resistor Select circuit. The RESOLUTION BW switch selects the capacitive portion of the RC filter by switching in different capacitors in the Crystal Bandwidth and Video Filter Capacitor Select circuit and the LC Bandwidth and Video Filter Capacitor Select circuit.

When the SWEEP TIME/DIV switch is set to AUTO, the sweep time is controlled to provide the fastest possible sweep time while still maintaining amplitude calibration. Therefore, when either the VIDEO FILTER or RESOLUTION BW setting is changed, the sweep time is changed by varying the current supplied by the Auto Sweep Time Video Filter line or the Auto Sweep Time Bandwidth–Frequency Span.

The Crystal-LC Bandwidth Select circuit decodes information from the RESOLUTION BW switch and controls the BW5 line to determine whether crystal or LC filters are used in the Bandwidth Filter No. 1 and No. 2 Assemblies. LC filtering is used for the four wider bandwidths (100 kHz to 3 MHz) and crystal filtering, for the four more narrow bandwidths (1 kHz to 30 kHz.)

When LC filtering is used, the LC Bandwidth and Video Filter Capacitor Select circuit controls (through the BW7 line) the current for the PIN diodes in the Bandwidth Filter No. 1 and No. 2 Assemblies. When crystal filtering is used, the Crystal Bandwidth and Video Filter Capacitor Select circuit performs this function through the BW6 line.

Changes in the AMPLITUDE SCALE are accomplished by first amplifying the video signal and then attenuating it various amounts. The accuracy of absolute measurements is maximized by minimizing errors introduced in the peak signal voltage. This is accomplished by the First Video Amplifier (see Figure 8-118), which first offsets the 0V to +0.8V video signal to −0.8V to 0V and then amplifies it by a gain of 9. This amplified signal is then attenuated in the Scale Attenuator, which is controlled by the AMPLITUDE SCALE setting on the front panel. The Second Video Amplifier offsets the signal again and amplifies it by a gain of 1.11 so that +0.8V represents a full-screen deflection. The signal is then sent to the Y Deflection Amplifier Assembly to be displayed on the CRT, to the Z Axis Amplifier Assembly for the baseline clipper, to the Sweep Generator Assembly to trigger the sweep in the VIDEO mode, and to the rear panel for the VERTICAL OUTPUT.

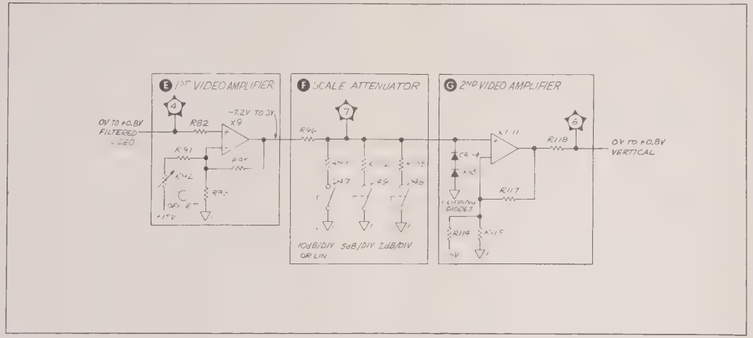

Figure 8-118. Amplitude Scale Circuits

Video Filter Resistor Select A

With the VIDEO FILTER switch in OFF, +15V is routed through the switch to the bases of Q4 and Q6. These transistors turn on, turning on Q1 and grounding the AST VF (Auto Sweep Time Video Filter) line to the Sweep Generator Assembly. The only series resistance the signal sees is the output of the Log Amplifier Assembly (approximately 147Ω). In the .3 position, Q14 and Q16 are turned on, turning on Q12 to route the VIDEO signal through R11 and to place R16 in parallel with R40 on the AST VF line. The .1, .03, .01, and .003 positions operate in the same way except that in the .003 position, only R40 is connected to the AST VF line.

The .003 position can also be activated by +15V routed through the FREQUENCY SPAN MODE switch when it is in the FULL BAND or the 1.7 — 22 GHz SPAN mode. In the NOISE AVG positions, Q39 is turned on, turning on Q37 to route the signal through R35.

The video bandwidth is further reduced by turning on Q26 and Q21, shunting the signal with C8. The AST BW-FS (Auto Sweep Time Bandwidth–Frequency Span) line to the Sweep Generator Assembly, used to adjust the AUTO sweep time, is shunted to ground through R81.

Crystal-LC Bandwidth Select B

Either LC or crystal filtering is selected by routing +15Vthrough five dc control lines (BW0 through BW4) from the front panel RESOLUTION BW switch. Each of the lines BW1 through BW4 selects one of the crystal and one of the LC bandwidths. The BW0 line determines whether crystal or LC bandwidth filtering is selected. In the LC mode, a +15V is applied to the base of Q9, which turns on Q15 and turns off Q13, causing BW5 to reach about +14.8V. This enables only the LC bandwidths (in the Bandwidth Filter No. 1 and No. 2 Assemblies). When BW0 is low, Q9 and Q15 are off and Q13 is on, causing BW5 to go to about −0.5V. This enables only the crystal bandwidths.

Crystal Bandwidth and Video Filter Capacitor Select C

LC Bandwidth and Video Filter Capacitor Select D

The approximately +10V of the AST BW-FS line is buffered by U1A and doubled by U1B (both in the LC Bandwidth and Video Filter Capacitor Select circuit. R130 provides a constant current to the AST BW-FS line.

When 3 kHz BW (BW2) is selected, two actions take place. +15V is routed through the RESOLUTION BW switch to the base of Q7 and Q32. These two transistors turn on, turning on Q8 and Q36 and grounding one end of C2, C6, and R72. C2 (the effect of C6 is negligible) forms the capacitive portion of the RC lowpass Video Filter. The current through R72 is applied to the Sweep Generator Assembly for control of the AUTO sweep time. At the same time, BW0 is open, allowing BW5 to go low and turn off the LC section of the Bandwidth Filter No. 1 and No. 2 Assemblies. This also keeps Q38 and Q40 off, enabling the crystal bandwidths to be controlled individually. When Q7 and Q8 turn on, the PIN diode current in BW6 is set by the voltage source Q5 and R55. The 3 kHz BW ADJ R55 adjusts the 3 kHz resolution bandwidth to allow for PIN diode tolerances. When other crystal bandwidths are selected, other transistor pairs are turned on. This changes the PIN diode current in BW6, varies the AUTO sweep current in the AST BW-FS line, and selects the capacitors used in the video filter.

In the 1 kHz, 300 Hz, and 100 Hz bandwidths, +15V, applied to the BW1 line through the front-panel RESOLUTION BW switch, turns on Q56 and Q57, causing the BW10 line to go high, enabling the 1 kHz bandwith. BW1 also turns on Q3, Q7, and Q8, grounding one end of C1 and C2 to form the capacitor portion of the RC low-pass video filter and activating the 3 kHz bandwidth through BW6. The AUTO sweep time is set by the Sweep Generator Assembly.

In the 300 Hz bandwidth, +15V is applied to BW9, turning on Q21 and shunting the signal with C8 and C18. BW9 also turns on Q59 and switches R126 in parallel with R130 to set the AUTO sweep time.

In the 100 Hz bandwidth, +15V is applied to BW8, turning on Q55 and shunting the signal with C19. BW8 also turns on Q58, placing R127 in parallel with R130 to set the AUTO sweep time.

When selecting the 300 kHz BW (BW2), +15V is applied to the BW0 line from the RESOLUTION BW switch. This drives the crystal or LC line (BW5) to about +14.8V, which partially disables the crystal section and allows use of the LC bandwidths. Q40 turns on, back-biasing CR14 and leaving the BW7 line free to control the LC bandwidths. Q38 also turns on, bringing BW6 low to turn the crystal bandwidths off and preventing Q3, Q7, Q10, and Q18 from being turned on. With Q3, Q7, Q10, and Q18 off, C1, C2, C3, and C4 cannot effect the video filter. BW0 also turns Q31 on, which changes the AUTO sweep time by adding the weighting resistor R67 to the AST BW-FS line. The +15V from the RESOLUTION BW switch (BW2 line) turns on Q32 and Q36, grounding R71, R72, and C6. The voltage source Q35 and R71 sets the PIN diode current for the 300 kHz BW and allows adjustment for PIN diode tolerances. The current through R72 and R67 fixes the AUTO sweep time, and C6 changes the amount of video filtering.

The selection of other LC bandwidths, with the RESOLUTION BW switch, turns on other transistor pairs. This changes the LC PIN diode curent in BW7, varies the AUTO sweep current in AST BW-FS, and selects the capacitor used in the video filter. The negative voltage from Q33 ensures that none of the transistor pairs for the narrower bandwidths turns on, which keeps the large capacitors C1, C2, C3, and C4 from being connected to ground. C5, C6, C7 and stray capacitance in the 3 MHz BW become the video filter capacitors for the appropriate LC bandwidths. The resistors R71, R74, and R77 control the current for the proper LC bandwidth PIN diodes. In the 100 kHz resolution bandwidth (BW1), the sweep time is correct without switching in additional AUTO sweep control current, and the PIN diode current is preset in the Bandwidth Filter No. 1 and No. 2 Assemblies. The conduction of Q31 adds R67 to the AST BW-FS line to speed up the AUTO sweep time for the wider LC resolution bandwidths.

First Video Amplifier E

The detected and filtered video input (0V to +0.8V) is applied to the gate of Q43A. Q43, Q44, Q45, and Q46 make up a differential amplifier. The gate of Q43A is the non-inverting input and the gate of Q43B, the inverting input. The output at the emitter of Q46 is feedback applied to the gate of Q43B through a voltage divider consisting of R95 and the series-parallel combination of R91, R92, and R93. C16 and L3 change this voltage division at high frequencies to help increase the gain. The voltage gain of the amplifier is 9. +15V is applied to the OFFSET adjustment R92 to offset the input voltage by −0.8V so that the peak of the output signal is 0V. This minimizes any errors in the peak signal voltage that may be introduced by the Scale Attenuator. With an input voltage range of 0V to +0.8V, the signal at the emitter of Q46 will be −7.2V to 0V. Q42 and Q41 are current sources to bias the differential amplifier, and C17 is used to introduce negative feedback at high frequencies to prevent oscillation.

Scale Attenuator F

In 10 dB/DIV or LIN, +15V is routed through the front panel AMPLITUDE SCALE switch to the base of Q47, turning on Q47 and grounding one end of R99. R99 and R96 form a resistor divider which attenuates the output of the First Video Amplifier by about 1/10. This −0.72V to 0V signal is then applied to the input of the Second Video Amplifier.

In 5 dB/DIV, Q49 turns on and grounds R102, which attenuates the video signal by about 1/5. In 2 dB/DIV, R96 and R105 attenuate the signal by approximately 1/2, and in 1 dB/DIV the signal is not attenuated at all.

Second Video Amplifier G

The Second Video Amplifier functions in the same way as the First Video Amplifier, with Q50, Q51, Q52, and Q53 making up the differential amplifier. The gate of Q50A is the non-inverting input, and the gate of Q50B is the inverting input. The output of the Scale Attenuator is clipped at about −1.2V by CR34 and CR35 and then applied to the gate of Q50A. The output of the emitter of Q53 is feedback applied to the gate of Q50B through the voltage divider consisting of R117 and the parallel combination of R114 and R115.The voltage gain of the amplifier is 1.11. R114 is used to offset the input voltage by +0.72V and compensate for the negative offset in the First Video Amplifier. With an input voltage of −0.72V to 0V, the signal at the emitter of Q53 (and at TP8) would be 0V to +0.8V. Q54 is a current source to bias the differential amplifier, and C11 supplies negative feedback at high frequencies to prevent oscillation. R118, R121, R120, and R119 act to buffer the various outputs.

The FULL BAND frequency marker is generated by a negative voltage applied to R122 and R94 from the Full Multiband Assembly. This forward biases CR33, causing the vertical signal to the Y Deflection Amplifier Assembly to dip slightly (about −0.05V) at the tuned frequency.

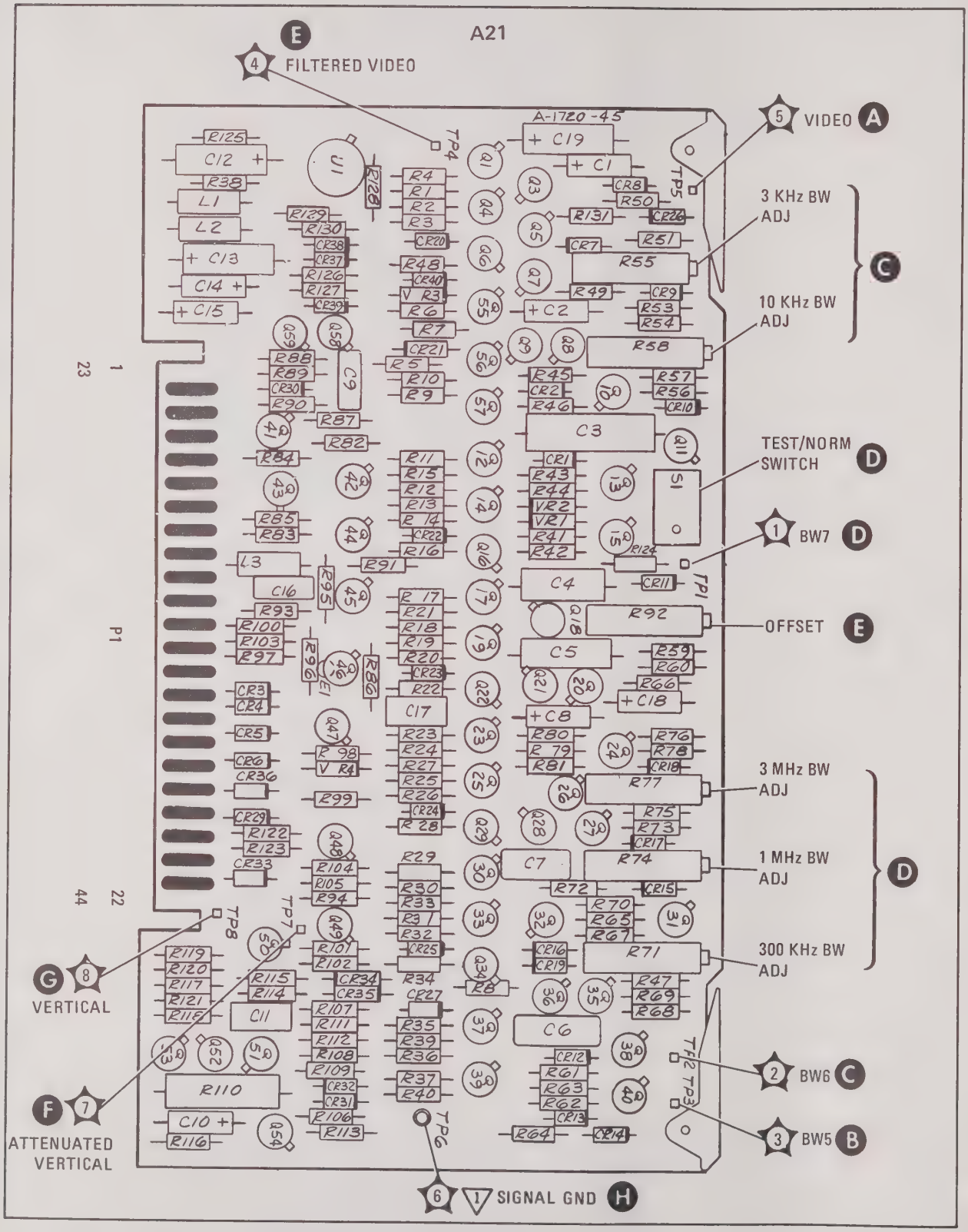

Figure 119. A21 Video–100 Hz Assembly (Option 100), Component Locations

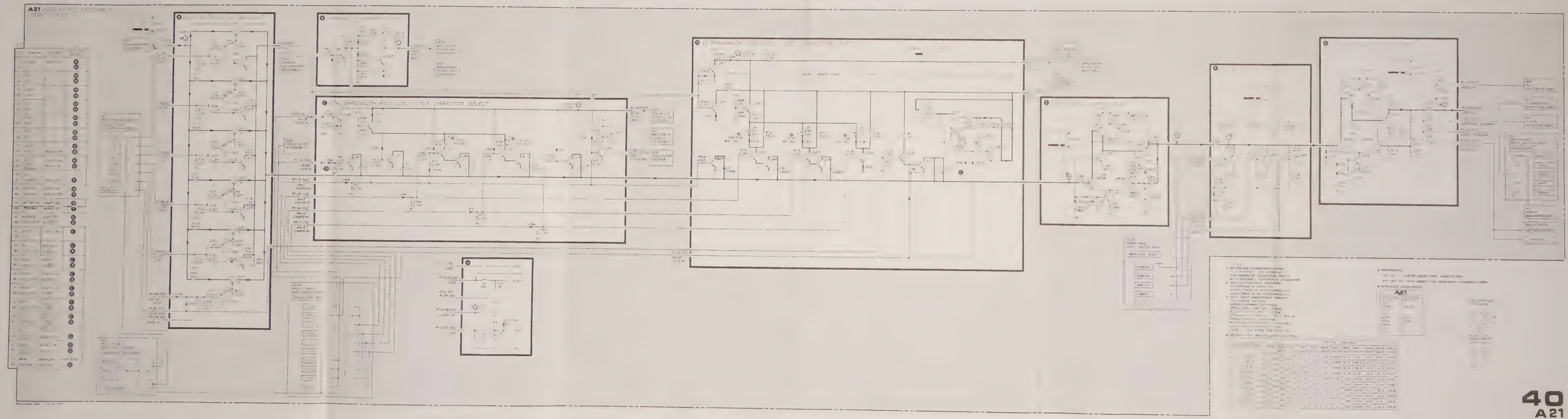

Figure 8-120. A21 Video-100 Hz Assembly (Option 100), Schematic Diagram

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